SURVEY PRO

for Ranger

Reference Manual

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900-0032-XXQ **090407**

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Appendix A

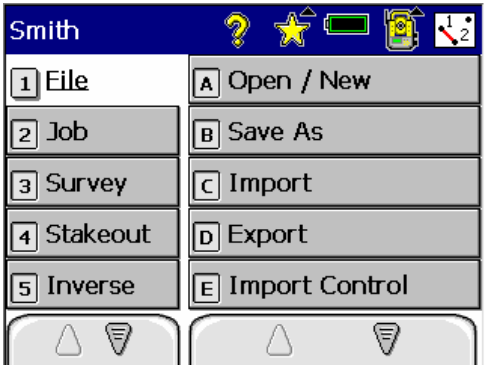
Transverse Mercator Zones A-1
Lambert Zones A-2

Welcome

Congratulations on your decision to purchase a Tripod Data Systems product. TDS is serious about providing the best possible products to our customers and know that you are serious about your tools. We are proud to welcome you to the TDS family.

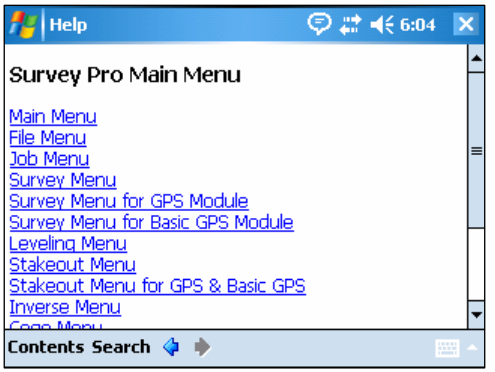
The TDS Survey Pro team is continually improving and updating Survey Pro. Please take a few minutes to register your copy so that you will be eligible for upgrades. You can do this either by completing and returning the product registration card or by visiting our Web site (www.tdsway.com).

Main Menu



The Main Menu is the starting point where all the other Survey Pro screens described in this manual are accessed.

The area at the top of the screen is called the *command bar*. The small buttons in the command bar are used as follows:



Online Help

Tapping the button opens the online help, which allows you to access information similar to the information you would find in the reference manual for each screen.

Quick Pick

The Quick Pick button is used to quickly access any of a variety of commonly-used Survey Pro routines. The list of routines available is customizable using the Quick Pick Editor (Page R-442).

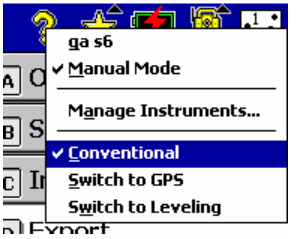
The User's Manual also contains more information on using the Quick Pick button and Quick Pick Editor.

Battery Level

The battery icon indicates the condition of the data collector's rechargeable battery. The icon has five variations depending on the level of charge that is remaining: 100%, 75% 50%, 25% and LOW 5%.

Tapping the battery icon is a shortcut to the Microsoft Power Settings screen. You can view the online help for this screen on a Ranger 300X/500X by tapping then Help, or on a Ranger by tapping ?.

Surveying Mode



The instrument icon indicates which collection mode the software is running in. There are three possible surveying modes: Conventional, GPS, and Leveling. Tapping this icon will open a list of options to do any of the following:

- Switch to another instrument mode.
- Select a different instrument profile.
- Quickly access the Instrument Settings screen (Page R-38).

Map View

A map view of the current job can be displayed by tapping the button. This screen is described on Page R-444.

OK

This button performs the desired action then closes the current screen.

Cancel

This button is red in color and closes the current screen without performing the action intended by the screen.

Close

This button is green in color and closes the current screen.

Settings

This button opens the Settings screen associated with the current screen.

GPS Status

This is used to view the current status and access the settings for a GPS receiver when using the GeoLock feature (Page R-162). It is only available from the Remote Control and Remote Shot screens when using a Trimble or Geodimeter robotic total station.

File Menu

The File Menu contains routines to transfer files between the data collector and another device.

A: Open / New

B: Save As

C: Import

D: Export

E: Control Panel

F: Backup / Restore Job

F: Transfer

H: Register Modules

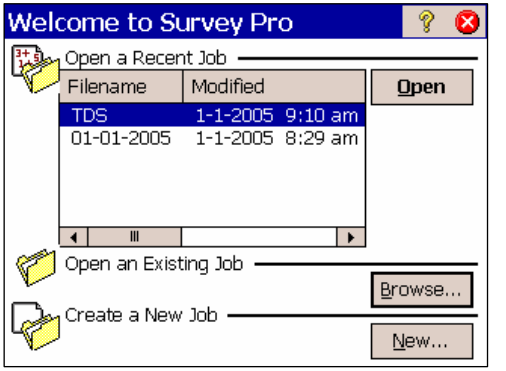
I: About Survey Pro

J: Exit

Open / New

File | Open / New

The Open / New screen is used to open an existing job or create a new one. This screen also appears when Survey Pro is first started.



Open: will open the job selected in the Open a Recent Job list.

Browse...: will open the Open screen (Page R-13) where an existing job to open can be selected.

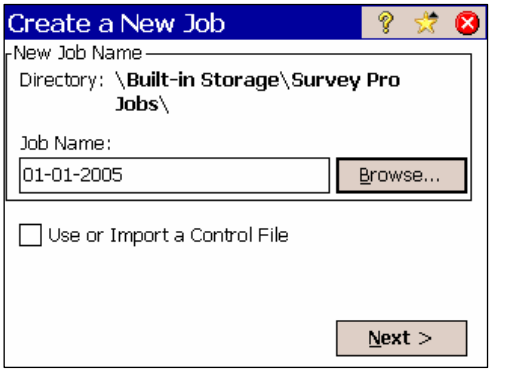
New...: will open the New screen (Page R-8) where a new job can be created.

New Job

File | Open / New | New...

The New Job wizard is used to create a new job.

Create a New Job 1



Directory: displays the directory where the current job will be stored.

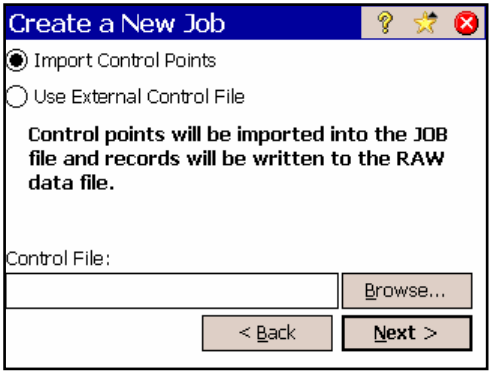
Job Name: is where the name of the new job is entered. The default name is the current date.

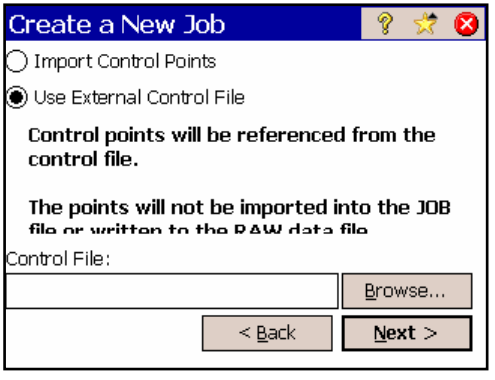
Browse...: allows you to select a different directory where to store the new job.

Use or Import a Control File: when checked, you can select an external control file or import the points from a different job as control points.

Next > : opens the next screen. The screen that opens depends on if a control file will be used.

Create a New Job 2 – (Imported or External Control File)


Create a New Job
Import Control Points
Use External Control File
Control points will be imported into the JOB file and records will be written to the RAW data file.
Control File:
Browse...
< Back
Next >


Create a New Job
Import Control Points
Use External Control File
Control points will be referenced from the control file.
The points will not be imported into the JOB
Control File:
Browse...
< Back
Next >

This screen will only open next when a control file will be used or imported.

Import Control Points: When selected, the points in the control file will be imported into the new job.

Use External Control File: When selected, the control points in the control file will be accessible from the new job, but will not be imported.

Control File: displays the path and control file name selected with the Browse... button.

Browse... : will open the Open screen (Page R-13) where an existing job can be selected as a control file.

< Back : returns you to the previous screen.

Next > : opens the next screen.

Create a New Job 3

Azimuth Type: specifies if you are surveying with a North Azimuth or South Azimuth.

Units for Distances: specifies if your distances will be entered in International Feet, U.S. Feet, or Meters.

Note: You can enter a distance in any distance field in units other than what is set for the job by appending the distance value with the following characters:

- **f** or **ft** or **ift** International Feet
- **usf** or **usft** US Survey Feet
- **i** or **in** Inches
- **m** Meters
- **cm** Centimeters
- **mm** Millimeters
- **c** or **ch** Chains

Once the cursor leaves that field, the distance will be converted automatically. (A space between the value and the unit abbreviation is optional.)

Units for Angles: specifies if angles will be entered in Degrees or Grads.

☑ **Adjust for Earth Curvature / Refraction**: when checked, the elevations recorded from all shots will be adjusted to compensate for earth curvature and refraction.

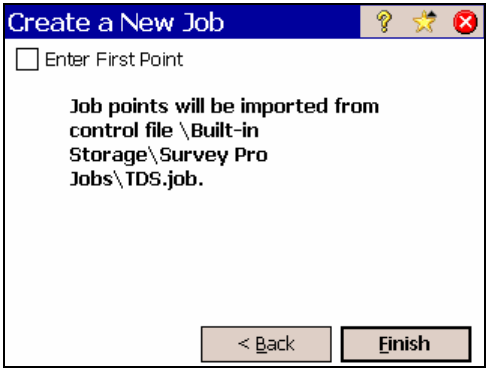
☑ **User Scale Factor**: when checked, all horizontal distances when taking shots will be adjusted by the scale factor entered here.

Next >: opens the final screen, which can be one of two different possible screens depending on if a control file is being imported.

Create a New Job 4 – (Imported Control File)

This screen will only open when a control file is being imported.

Screen when checkbox is unchecked.


Create a New Job
Enter First Point
Job points will be imported from control file \Built-in Storage\Survey Pro Jobs\TDS.job.
< Back
Finish

Screen when checkbox is checked.

Enter First Point: when this box is checked, the additional fields will appear allowing you to create a new point.

Note: Although all new jobs must have at least one point, creating a new point when importing a control file is optional since points are already being loaded into the job in the form of control points.

Point Name: is the name of the initial point.

Northing: is the Y-coordinate of the initial point.

Easting: is the X-coordinate of the initial point.

Elevation: is the elevation of the initial point.

Description: is the description of the initial point.

< Back: returns you to the previous screen.

Finish: stores a new job file and raw data file using the specified information.

Create a New Job 5 – (External or No Control File)

Point Name: is the name of the initial point.

Northing: is the Y-coordinate of the initial point.

Easting: is the X-coordinate of the initial point.

Elevation: is the elevation of the initial point.

Description: is the description of the initial point.

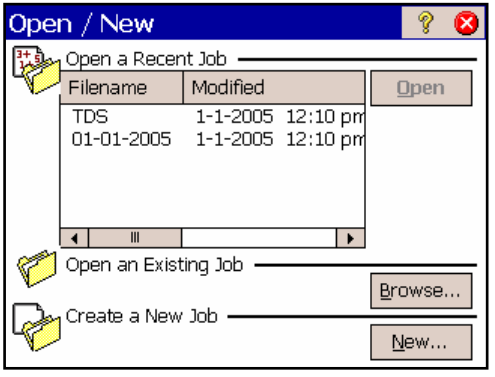
< Back: returns you to the first screen.

Finish: stores a new job file and raw data file using the specified information.

Open

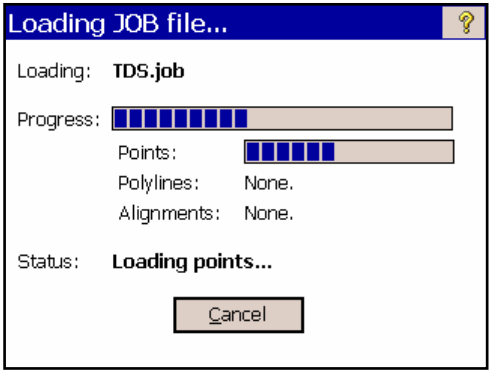
File | Open / New | Browse...

The Open screen is used to open an existing job.



A list of all the jobs in the current directory is displayed. Simply tap on the job name that you want to open and then tap ✔.

Note: TDS CR5 files can be opened just like any Survey Pro JOB file. When a CR5 file is opened, it is automatically converted and stored to a JOB file with the same name. If a matching RW5 raw data file exists, it too will be converted and saved to a Survey Pro RAW file with a note inserted indicating that the conversion took place.

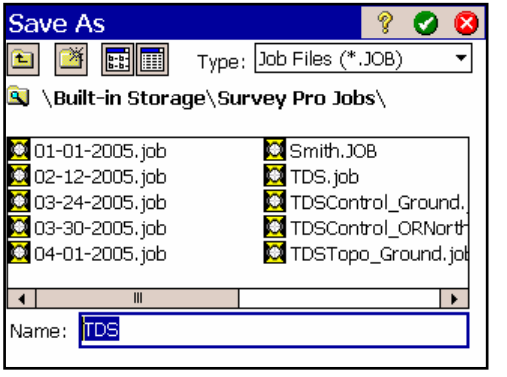


When a job is being opened, the Loading JOB file screen will open and display the status of the loading process.

Save As

File | Save As

The Save As screen allows you to save a copy of the current job under a new name. The copy that is created will then become the current job.



The Save As dialog box is identical to that found in the Windows operating system. Simply enter a new name for the current job and then tap the Save button.

Note: It is not necessary to include the .JOB extension since it will automatically be added for you.

Import

File | Import

The Import screen is used to add the points from another source into the current job or import the data from a LandXML file to the current job.

Warning: Coordinate values can change when they are imported!

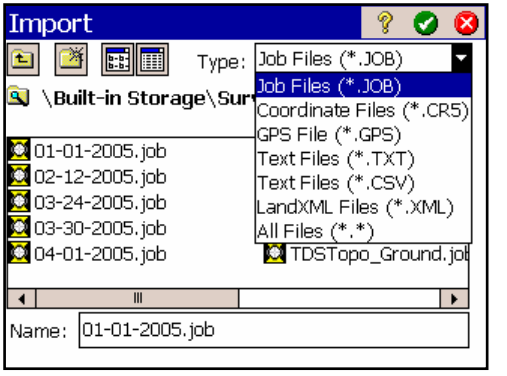
Importing coordinates from any source other than a JOB file requires that the distance units used in the source file be specified. It is not necessary to specify the distance units when importing coordinates from a JOB file since those units are written within the file.

If importing coordinates where the distance units in the source file are different than the distance units for the current job, the imported coordinates will be converted to the current job's distance units when they are imported. This is normally the desired result, but it can cause a problem if any distance units were set incorrectly. This situation can most commonly occur when working with International Feet and US Survey Feet where the conversion from one to the other is not always obvious.

Usually the difference between International Feet and US Survey Feet is negligible (2 parts per million), but when dealing with State Plane or UTM mapping plane coordinates, which are often very large in magnitude, the difference can be substantial if the coordinates are converted from one format to the other.

If importing coordinates from a source, such as an HP 48, where you are not sure if the units are in International Feet or US Survey Feet into a job that is set to International Feet or US Survey Feet, you will usually just want to import them without any conversion being performed. To do this, be sure to select the same distance units for the source file as those set for the current job.

Coordinates from a variety of file types can be imported into the current job. The first Import Coordinates screen is used to select from the file types listed below. The next screen that opens depends on the selection made here.



- **Job Files (*.JOB)**: import coordinates from another Job file.
- **Coordinate Files (*.CR5)**: import coordinates from a TDS CR5 coordinate file.
- **GPS Files (*.GPS)**: import coordinates from a TDS GPS coordinate file.
- **Text Files (*.TXT)**: text files can contain coordinates in several different possible formats. The Import ASCII Wizard is used to define the format of the text file being imported.
- **Text Files (*.CSV)**: this is a simplified text file import routine where the source file is comma delimited and has a *.CSV extension.
- **LandXML Files (*.xml)**: imports points, alignments, polylines, and parcels from a LandXML file.

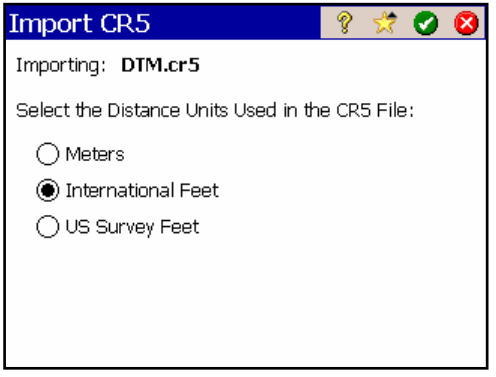
*Import *.JOB Coordinates*

When importing coordinates from another *.JOB file, the Import Coordinates screen is used, described above.

A list of all the jobs available in the current directory is displayed. Simply tap on the job name that you want to import and then tap the button. The points in the selected job will be added to the points in the current job.

Import *.CR5 Coordinates

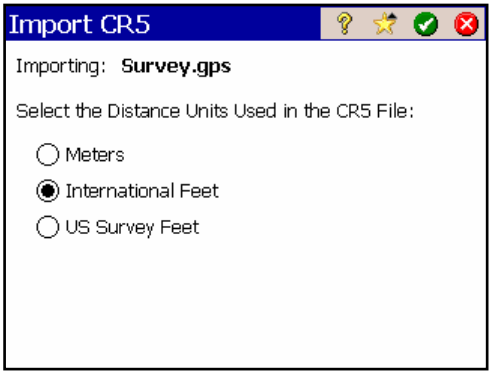
When importing a CR5 file, you will first be prompted to select the layer where you want the new data stored. Select a layer and tap ✔ to continue.



In the next screen, select the distance units that the coordinates were stored in and tap ✔.

Import *.GPS Coordinates

When importing a GPS file, you will first be prompted to select the layer where you want the new data stored. Select a layer and tap ✔ to continue.

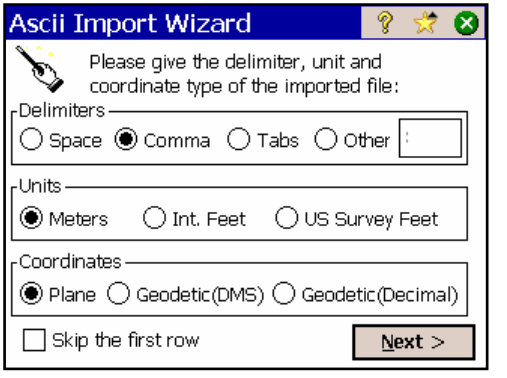


In the next screen, select the distance units that the coordinates were stored in and tap ✔.

When importing coordinates from both a TDS CR5 and GPS file from the same job, the GPS coordinate will be linked to the coordinates in the CR5 file. For more information on this, refer to the GPS User's Guide.

*Import *.TXT Coordinates*

When importing a TXT file, you will first be prompted to select the layer where you want the new data stored. Select a layer and tap ✔ to continue.



Since the coordinates in an ASCII TXT file can be stored in a variety of formats, two screens are used to define the format of the file that is being imported once a layer is selected. The source TXT file can contain either plane coordinates or geodetic coordinates.

Delimiters: is the character that separates each column of text in the ASCII file.

Units: are the units that the distances in the file were stored in.

Coordinates: is used to specify if the coordinates are plane coordinates, geodetic coordinates in degrees-minutes-seconds format, or geodetic coordinates in decimal format.

☑ **Skip the first row**: should be checked if the first line in the ASCII file contains non-coordinate information, such as a heading.

Next >: opens the second screen.

*Import *.TXT Coordinates – Screen Two*

▸ Name Column No. / ▸ Start Point Name

When the first option is selected here, the column number used for the name field in the *.TXT file is specified here. When the second option is selected, it is assumed that the *.TXT file does not contain point names and will assign the first point the name specified here and increment to the next available point name for the remaining points.

Columns: is where the column number for each specified coordinate exists in the source *.TXT file. The coordinates types displayed here can either be for plane coordinates or geodetic coordinates depending on the selections made in the previous screen. If a coordinate has a checkbox, which is unchecked, it is assumed that the source *.TXT file does not contain columns for that type of coordinate.

☑ **Specify Missing Elevation Threshold**: if the source file was created from coordinates with no elevations, but the file contains an elevation column with values, such as 0, check this box and indicate the value in the field that will appear to the right.

Preview: opens the ASCII Import Preview window containing all the point data that will be imported. This is useful to check for errors before actually importing new data.

< Back: returns to the previous screen.

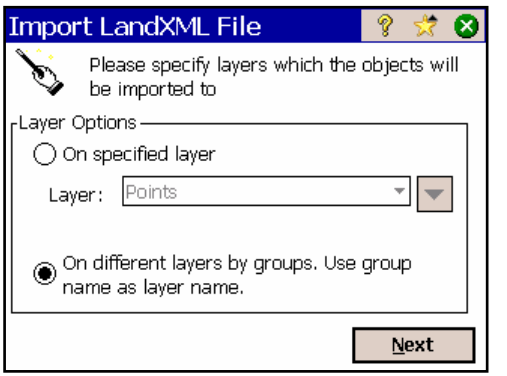
Finish: imports the new point data into the current project.

Import LandXML Coordinates

Points, alignments, polylines, and parcels can be imported from a LandXML file.

The way the LandXML data is imported depends on how the data is stored in the source file and how the settings are configured in the two screens described below.

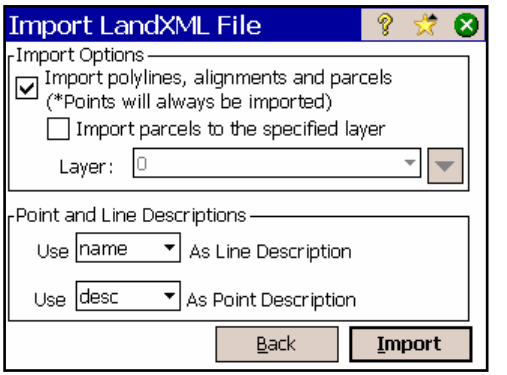
Consult the User's Manual for more information on the conditions that affect how the data is imported.


Import LandXML File
Please specify layers which the objects will be imported to
Layer Options
On specified layer
Layer:
Points
On different layers by groups. Use group name as layer name.
Next

On specified layer: will import all the data on the specified layer.

On different layers by groups: will import points, alignments, and parcels to layers named by the group name for the data in the source file. If the group name is an invalid layer name (e.g., it is empty or contains invalid characters), the data will be stored to the active layer.

Next > : opens the second configuration screen.



Import polylines, alignments and parcels: When this is checked, polylines, alignments and parcels will be imported, as well as the points. When unchecked, only the points will be imported.

Import parcels to the specified layer: When this is checked, imported parcels will be stored to the selected layer. If unchecked, parcels will be stored to the layer specified in the previous screen.

For more information on how parcels are imported, consult the User's Manual.

Point and Line Descriptions: You can select what information to use as the description for imported lines and points in the corresponding two fields.

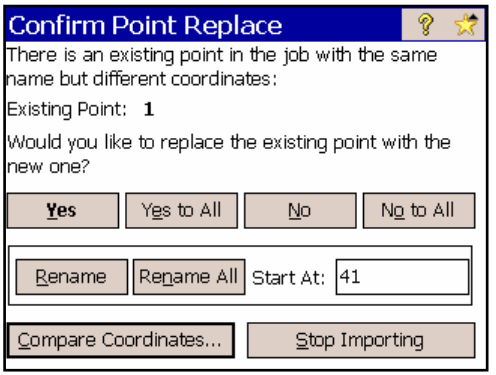
Lines can either be assigned the name or description from the source file and points can either be assigned the description or code from the source file.

Back: returns to the previous screen.

Import: imports the specified data into the current project. A results screen will open listing the details of the imported data.

Confirm Point Replace

If a point being imported has the same name and the same coordinates as a point that is already in the current job, it is ignored and a message will be displayed after the remaining points are imported to indicate this.



If an imported point is encountered with the same name, but with different coordinates as a point in the current job, the Confirm Point Replace screen will open.

Yes: will replace the point in the current job with the point being imported.

Yes to All: will replace the point in the current job with the point being imported and perform the same action for any remaining duplicate points.

No: will not import the duplicate point, keeping the coordinates for the existing point unchanged.

No to All: will not import the duplicate point, keeping the coordinates for the existing point unchanged and perform the same action for any remaining duplicate points.

Renumber: will store the new point in the current job under the name specified in the Starting At field.

Renum All: will store the new point in the current job under the name specified in the Starting At field and perform the same action for any remaining duplicate points, storing them with the next available point name.

Start At: is the point name assigned to the imported point when using the Renumber or Renumber All functions.

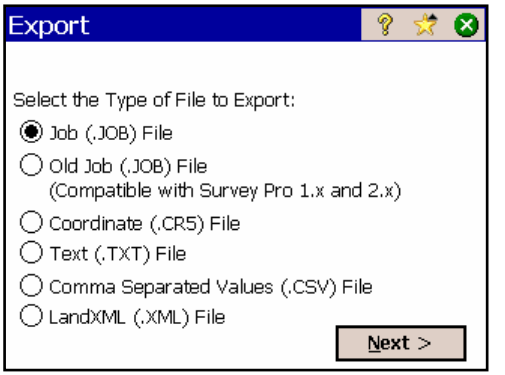
Compare coordinates...: will open a dialog box showing the coordinates for the duplicate points to assist in making a decision of how to handle the new point.

Stop Importing: will not import the current duplicate point and will stop importing any remaining points. All previous points will still be imported into the current job.

Export

File Export

The Export screen allows you to export selected points from the current job to a new job or to a coordinate file in another format. You can also export all the objects in the current job to a LandXML file. This first screen is used to specify the type of file that you want to export data to.



Job (.JOB) File: when selected, the points are exported to a TDS JOB file.

Old Job (.JOB) File: when selected, the points are exported to a TDS JOB file that is compatible with versions of Survey Pro earlier than 3.0.

Coordinate (.CR5) File: when selected, the points are exported to a TDS CR5 coordinate file format.

Text (.TXT) File: when selected, the points are exported to an ASCII text file.

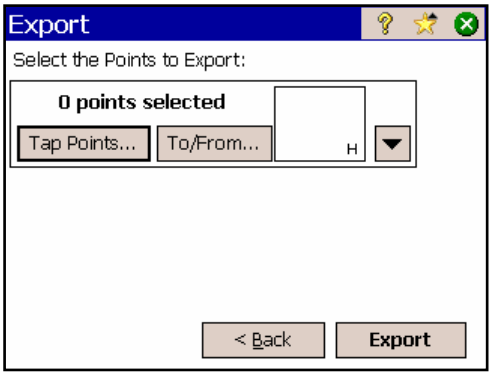
Comma Separated Values (.CSV) File: when selected, the points are exported to an ASCII text file that is comma delimited and the file is automatically given a *.CSV extension.

LandXML (.XML) File: when selected, the data is exported to a LandXML file and automatically given an *.XML extension.

Next >: opens the next screen, which is determined by the selected file type.

Export – Screen Two

The second Export screen will open for any file type that was selected in the previous screen except LandXML. This screen is used to select the points from the current project that you want to export to the selected file type. (Exporting to a LandXML file is described later.)



To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Tap Points...: allows you to select the points to export by tapping them from a map view.

▼: The power button provides additional point selection options, which include selecting all control points, all non-control points and selection by description.

< Back: returns to the previous screen.

Next >: opens the next screen, which is determined by the selected file type.

Export *.JOB Coordinates

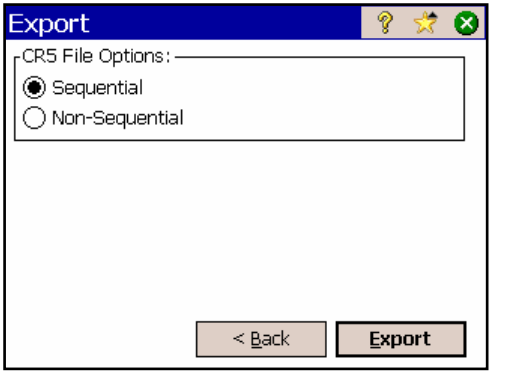
When exporting to another *.JOB file, the Save As screen is opened where the file name and location is entered for the new *.JOB file.

Export Old *.JOB Coordinates

This option functions exactly as the Export *.JOB routine, described above, only the resulting file is written to be compatible with the Survey Pro Version 2.x format, and earlier.

Export *.CR5 Coordinates

The Export CR5 dialog box will open when exporting coordinates to a TDS CR5 coordinate file.



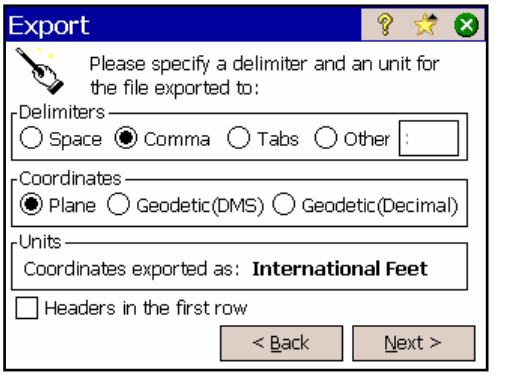
CR5 File Options: specifies if the resulting file should be Sequential or Non-Sequential. (The HP 48 data collector can only use sequential coordinate files.)

< Back: returns to the previous screen.

Export: exports the selected coordinates to the new CR5 file.

Export *.TXT Coordinates

Since the coordinates in an ASCII *.TXT file can be stored in a variety of formats, two screens are used to define the format of the resulting file.



Delimiters: is the character that separates each column of text in the ASCII file.

Coordinates: is used to select if the resulting coordinates should be plane coordinates, geodetic coordinates in degrees-minutes-seconds format, or geodetic coordinates in decimal format.

Units: are the distance units that will be written to the resulting TXT file. These units are automatically set to the same units that are set for the current job.

☑ **Headers in the first row**: When checked, a heading describing each column is inserted in the first row. For example, the following header could be inserted:

```
Name,Northing,Easting,Elevation,Description
```

< Back: returns to the previous screen.

Next > : opens the second screen.

Export *.TXT Coordinates – Screen Two

Select the desired order and format for the resulting TXT file from the list of options.

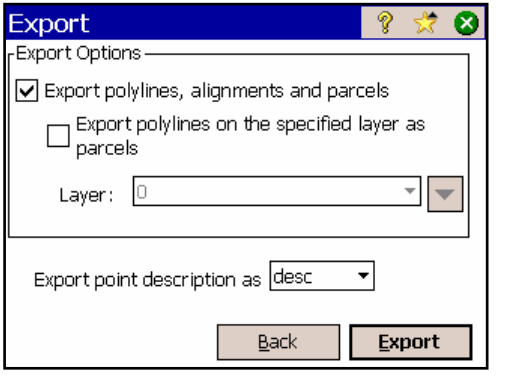
Finish : exports the selected points to the TXT file.

Export *.CSV Coordinates

This routine is identical to the Export *.TXT Coordinates routine, described above with the exception that the formatting for the exported file is automatically set to comma delimited and the extension for the file name will be *.CSV.

Export LandXML (.XML) File

Unlike the other export routines, which only export points, the LandXML export routine allows you to export points along with polylines and alignments.



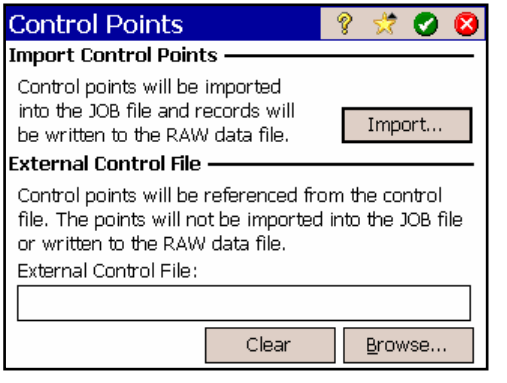
Export polylines and alignments: will export the points in the current project as well as any polylines and alignments. If this is unchecked, only the points will be exported.

Export polylines on the specified layer as parcels: will export the polylines on the selected layer as parcels. (Polylines on other layers will still be exported, only not as parcels.)

Export point description as: allows you to select to export the point descriptions as LandXML descriptions or codes.

Import Control Points

File | Import Control


Control Points
Import Control Points
Control points will be imported into the JOB file and records will be written to the RAW data file.
Import...
External Control File
Control points will be referenced from the control file. The points will not be imported into the JOB file or written to the RAW data file.
External Control File:
Clear
Browse...

The Import Control screen is used to manage a control file for the current job.

Import...: opens the Open screen (Page R-13) where an existing job can be selected as a control file. The control points will then be imported into the current job and stored to the CONTROL layer.

External Control File: displays the path and file for the current external control file (if one is used).

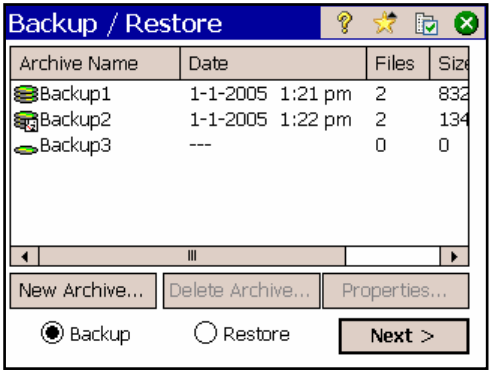
Clear: clears the current external control file.

Browse...: opens the Open screen (Page R-13) where an existing job can be selected as an external control file. (If any point names in the

external control file are also used in the current job, the control file cannot be used.)

Backup / Restore Job

File | Backup / Restore



The Backup / Restore wizard is a series of screens that are used to backup or restore all the files associated with the current job.

The routine also gives you the option of storing a snapshot of a customized map view to the archive. This can then be used to visually identify an archive.

Any number of backups can be created for a particular job. All the existing backups for the current job are listed in the main Backup / Restore screen, along with other information including the date the backup was created, the number of files stored in the archive and if the archive includes a snapshot. Archives that include a snapshot are shown with a icon, while those without a snapshot have a icon. The icon is used when a new archive has been created, but a backup has not yet been stored to it.

All of the backups for a particular job are physically stored to a single compressed file located in the \Built-in Storage\Survey Pro Jobs directory on the data collector. This file will have the same filename as the current job, only the *.Backup extension is appended to the name. For example, the backups for a job with a filename of Smith.Job will be stored in a file called Smith.Job.Backup.

New Archive...: opens the New Archive dialog box where a name is entered for the new backup archive being created. Once created, an empty archive will be listed in the main Backup / Restore screen, which can then be selected to backup the current job.

Delete Archive...: opens a prompt asking if you are sure. If you select Yes at the prompt, the archive selected from the main Backup / Restore screen will be deleted.

Properties... : opens the Archive Properties screen.

Backup: when selected, tapping Next> will begin the backup routine where the data for the current job will be stored to the selected archive.

Restore: when selected, tapping Next> will begin the restore routine where the data from the selected archive will be restored, overwriting the current job.

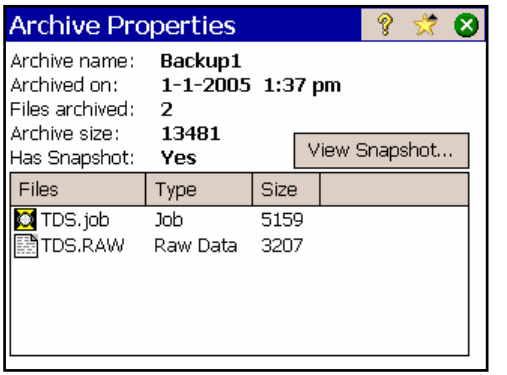
Next> : opens the next screen.

Backup / Restore - Archive Properties

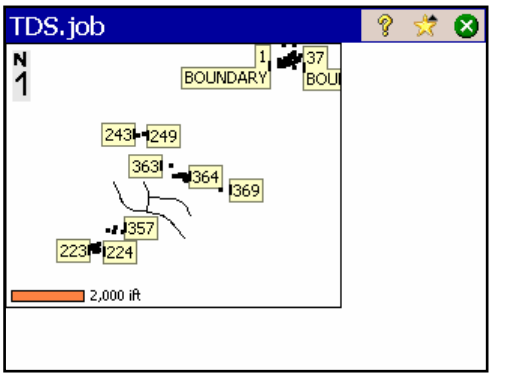
File | Backup / Restore | Properties...

The Archive Properties screen lists the files stored within the selected archive along with other information.

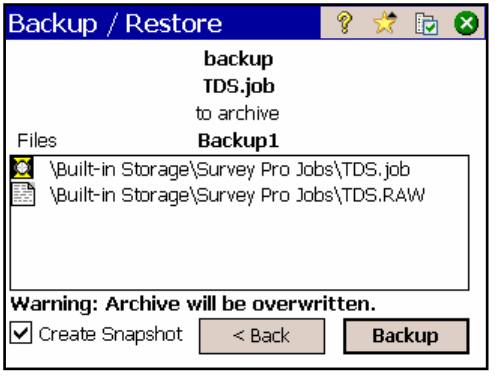
The file sizes listed in this screen are in bytes. Since all backup archives are compressed, the file sizes displayed represent the compressed files, or the amount of space actually being used by the file(s) on the data collector.



View Snapshot... : will display the snapshot from the selected archive if one was included when the archive was originally created.



Backup / Restore – Backup



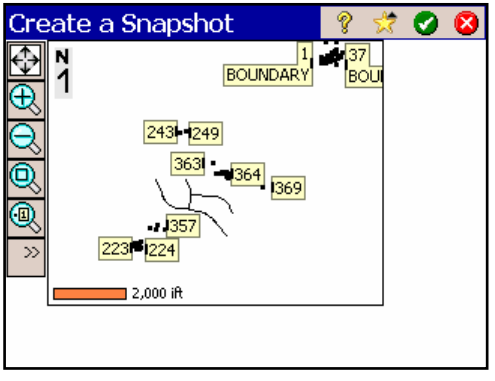
When performing a backup, all the files associated with the current job are listed and will be included in the archive.

☑ **Create Snapshot**: When checked, the next screen will prompt you to create a snapshot of the current job's map view, which will then be included in the archive.

< Back : returns to the previous screen.

Backup : opens the next screen.

Backup / Restore - Create a Snapshot



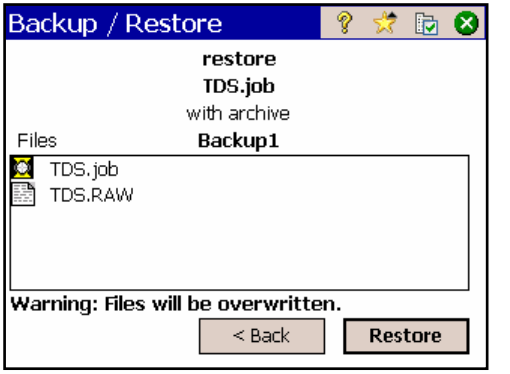
The Create a Snapshot screen is a map view that is used to configure the map as desired and the resulting image will be saved in the archive as a snapshot along with the job files.

: will create the archive along with a snapshot of the map as it is configured on the screen.

: will create the backup archive without a snapshot.

Backup/Restore – Restore

When restoring the job files from an archive, the archived files will replace the existing files of the current job.



Warning: If you do not want to lose any new data that was collected after the archive being restored was created, you should first backup the current job to a new archive before restoring an older archive.

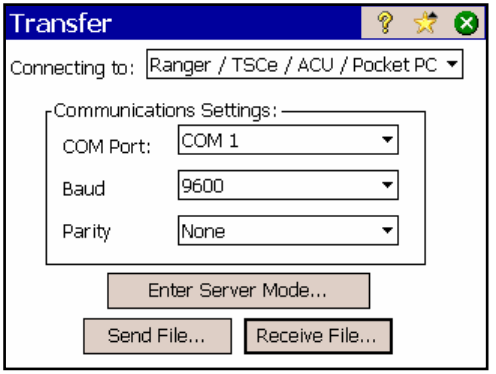
< Back: will return to the previous screen.

Restore: will restore the backed up job from the selected archive. The current job is then deleted and replaced by the backup job.

Transfer

File Transfer

The Transfer screen allows you to transfer files between the data collector and another device running TDS software.



Connecting to: specifies which device you are communicating with from the following options:

- HP48: if you are connecting to a Hewlett Packard HP48 calculator.
- Husky: if you are connecting to a Husky FS-series data collector.
- Ranger / TSCe / ACU / Pocket PC: if you are connecting to any of the devices listed.
- Windows PC: if you are connecting to a personal computer that is running Windows CE Services.
- Geodimeter 600: if you are connecting to a Geodimeter 600-series total station running TDS onboard software.

COM Port: specifies which COM port you are using on the local machine.

Baud Rate: specifies the communications speed. The baud rate must match in both units for successful communications.

Parity: specifies the parity. The parity must match in both units. When in doubt, select None here. All transfers are controlled from the PC when in this special mode.

Enter Server Mode: places the data collector in server mode where all file transfers are controlled from a PC running either TDS Survey Link or TDS ForeSight. Tapping Cancel will disconnect server mode.

Send File...: will open the Open dialog box where the file that you want to send can be selected. Once selected, the file is sent from the data collector to the specified device. A progress bar will be displayed

that indicates how much of the file has been transferred. Tapping Cancel will stop the file transfer.

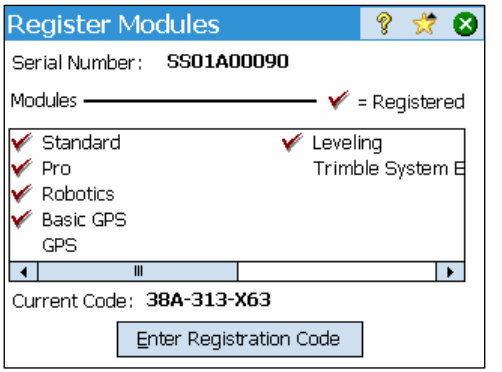
Note: The Send routine should be initiated shortly after issuing the receive command on the other device.

Receive File...: allows you to receive a file from another device. This should be tapped prior to issuing the Send command on the other device. Tapping Cancel will stop the file transfer.

Register Modules

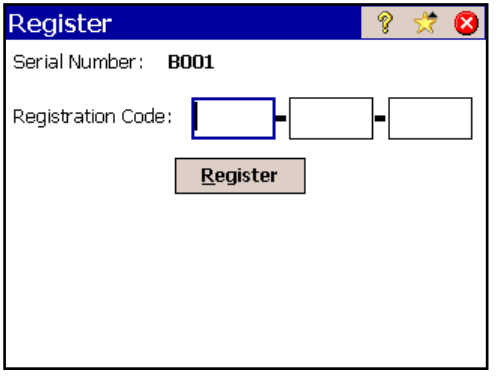
File | Register Modules

The Register Modules screen is used to upgrade the Survey Pro software. Refer to the User's Manual for more information on registering additional modules.



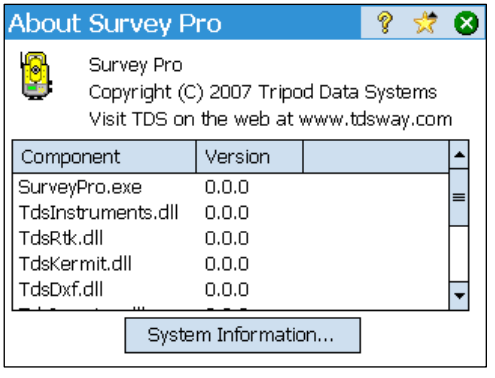
If no modules have been registered, Survey Pro will run in Demo Mode. When running in Demo Mode, users are able to test and use every routine available in the software, as if the Survey Pro Max module was purchased. Although, Demo Mode limits all jobs to no more than 25 points. If a job exists on the data collector that contains more than 25 points, it cannot be opened while running in Demo Mode.

Registered: Indicates that the corresponding module has been added.



Enter Registration Code: Opens the Register screen, shown here, where the registration number for a particular module can be entered.

About Survey Pro



File | About Survey Pro

The About screen displays the version of the Survey Pro software and the versions of several of the Survey Pro software files, which can be updated from the TDS Website.

Hardware Information: is a shortcut to the Microsoft System Properties screen.

Exit

File | Exit

This will close the Survey Pro software and return you to the operating system installed on your data collector.

Job Menu

A: Settings

B: Edit Points

C: Edit Polylines

D: Edit Alignments

E: Auto Linework

F: View Raw Data File

G: View DTM

H: Manage Layers

I: Job Information

J: Calculator

Settings

Job | Settings

See Page R-94 if running in GPS mode.

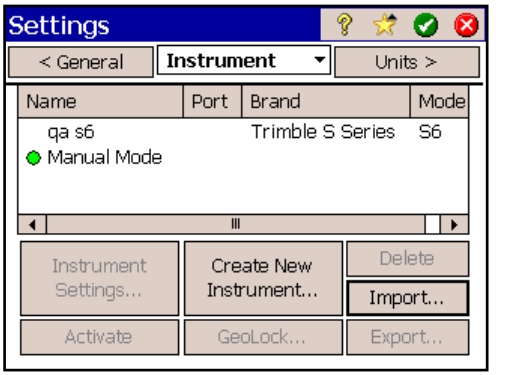
The Settings screen actually consists of several separate screens where each individual screen contains different types of settings.

There are two ways to navigate to the various screens. The first method is to tap the ▾ button to drop down the list of available screens and then tap on the desired screen from the list to open it. An alternate method is to tap the buttons to the side of the screen title, which will open the previous or next screen respectively. Repeatedly tapping either of these buttons will cycle through all the available screens.

Instrument Settings

Job | Settings | Instrument Settings

The Instrument Settings screen is actually the first of multiple screens used to identify and configure the instrument(s) you are using with Survey Pro. The correct settings must be configured for successful communications between the data collector and the instrument.



The upper portion of the first Instrument Settings screen lists the names of all the instrument profiles on the data collector. The other columns list the COM Port, Brand, and Model of the instrument defined in each profile.

Manual Mode: is a special profile that cannot be deleted. When activated, all surveying is performed without being connected to an instrument and all shot data must be entered manually.

Note: When running in leveling mode, the Instrument Settings... can be selected for Manual Mode to open the Level Method screen described on Page R-41.

Instrument Settings: opens the next Instrument Settings screen where the settings in the selected instrument profile can be modified.

Note: When editing an existing instrument profile, you cannot modify the instrument brand or model.

Create New Instrument: opens the next Instrument Settings screen where you can configure the settings for a new instrument and create a new instrument profile.

Activate: activates the selected instrument profile.

GeoLock: opens the GeoLock Settings screen (Page R-162).

Delete: deletes the selected instrument profile.

Import: imports an instrument profile from an instrument profile file that was previously loaded on the data collector.

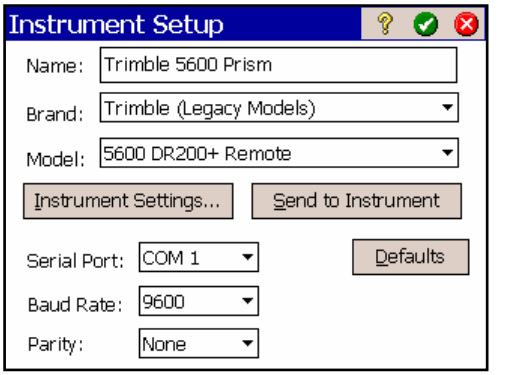
Export: saves the selected instrument profile to a file, which can then be transferred to another data collector and then imported.

Warning: Performing a hard reset on the data collector will result in all the user-created instrument profiles to be deleted. It is recommended that all instrument profiles be exported to files so in the event of a hard reset they can be recovered using the Import routine.

Instrument Settings – Screen Two

The second Instrument Settings screen opens whenever a new instrument profile is being created, or when an existing profile is being edited.

The options available on this screen will vary slightly depending on the total station model selected.



Name: is the name of the instrument profile being created or changed. This is the name that appears in the list on the first Instrument Settings screen.

Brand: is where you specify the manufacturer of the instrument that you are using from a dropdown list.

Model: is where you specify the model of the instrument that you are using from a dropdown list.

Instrument Settings...: opens the settings that are specific for the selected total station.

Send to Instrument: (applicable only on specific total stations) will send the selected instrument settings to the total station. This is particularly useful with robotic total stations after the total station has been reset.

Serial Port: is the serial port on the data collector used for communications with the total station. (Bluetooth can also be selected for wireless communication between the data collector and a compatible total station.)

Baud Rate: is the speed at which communication occurs with the total station. This must match the baud rate configured within the total station.

Parity: is the parity used for communication with the instrument. This must match the parity setting configured within the total station.

PIN: (applicable only when using Bluetooth with a Recon and a supported total station) is the Personal Identification Number that

was entered in the total station. These numbers must match for successful communications.

Bluetooth...: (applicable only when using Bluetooth with a supported total station) accesses the Bluetooth configuration screen that comes with the Bluetooth driver software where you can quickly check or change the virtual COM port and favorites.

Note: See the User's Manual for more information on configuring Bluetooth with a supported total station.

Defaults: will set the Serial Port, Baud Rate and Parity to their default values based on the selected total station.

Instrument Settings...: accesses the settings that are specific for the selected total station.

Send to Instrument: (applicable only on specific total stations) will send the selected instrument settings to the total station. This is particularly useful with robotic total stations after the total station has been reset.

NOTICE:

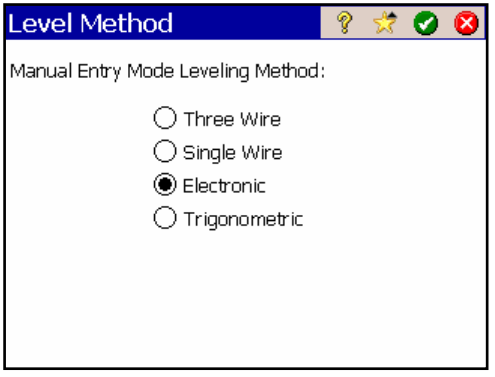
The settings that are available after tapping the Instrument Settings... button directly control the settings that are built into the selected total station. Since total station manufactures release new models every year, TDS cannot maintain the necessary set up documentation for every existing model and the models that are not yet available. The set up procedure for your particular total station is better handled by the total station manufacturer, or your instrument's dealer.

If you have specific questions on the set up of your total station you should refer to the documentation that was included with your total station. The numbers listed below are provided for your convenience:

Trimble:	800-538-7800
Zeiss:	800-538-7800
Geodimeter:	800-538-7800
Leica:	800-327-4773
Nikon:	516-547-8500
Pentax:	800-729-1419
Topcon:	800-223-1130

Level Method

Job Settings Instrument (select Manual Mode) Instrument Settings...



The Level Method screen is used to select the leveling method you want to use while running in leveling mode and while using Manual Mode. This will affect the type of data you are prompted for when taking shots.

Three Wire: Prompts for shot data will require upper, center, and lower wire readings.

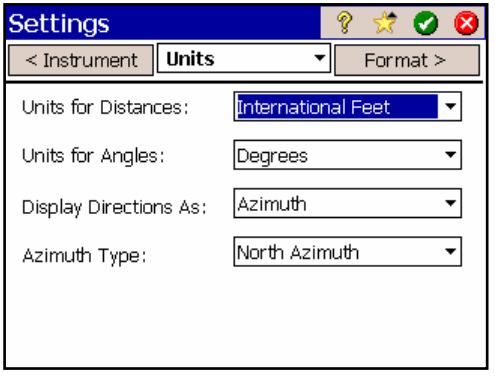
Single Wire: Prompts for shot data will require center wire readings only.

Electronic: Prompts for shot data will require a vertical and horizontal distance.

Trigonometric: Prompts for shot data will require a zenith angle and horizontal distance.

Units Settings

Job Settings Units



The Units Settings card defines the units that are used within the software, sent from the total station, entered from the keypad and displayed on the screen. You can select the following settings for your project from the following dropdown lists.

Units for Distances: defines the units used for length as Meters, International Feet, or US Survey Feet.

Note: You can enter a distance in any distance field in units other than what is set for the job by appending the distance value with the following characters:

- **f** or **ft** or **ift** International Feet
- **usf** or **usft** US Survey Feet
- **i** or **in** Inches
- **m** Meters
- **cm** Centimeters
- **mm** Millimeters
- **c** or **ch** Chains

Once the cursor leaves that field, the distance will be converted automatically. (A space between the value and the unit abbreviation is optional.)

Warning: When creating a new job, it is important that the Units for Distances field be set to the correct units. This allows you to seamlessly switch between different units in mid-job.

Problems can arise if these units are inadvertently set to the incorrect units when entering new data. For example, assume a new job was created by hand-entering a list of coordinates where the job was set to International Feet and the coordinates being entered were in US Survey Feet. Now assume you created another new job and correctly set it to US Survey Feet. If you then imported the hand-entered points from the other job, they would be converted to different units when no conversion should have taken place. Depending on the magnitude of the imported coordinates, the error after the conversion could be significant.

Units for Angles: defines the units used for angles as Degrees or Grads (gons).

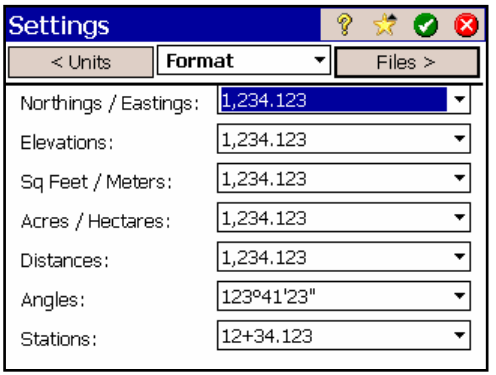
Display Directions as: will display directions as a Bearing or Azimuth.

Azimuth type: defines if you are using a North Azimuth or a South Azimuth.

Format Settings

Job | Settings | Format

The Format Settings card defines the number of places beyond the decimal point that are displayed for various values in all screens, and how stations are defined. (All internal calculations are performed using full precision.)



Northings / Eastings: will allow you to display from zero to six places passed the decimal point for northing and easting values.

Elevations: allows you to display from zero to six places passed the decimal point for elevations.

Sq feet / meters: allows you to display from zero to four places passed the decimal point for square feet or square meter values.

Acres / Hectares: allows you to display from zero to four places passed the decimal point for acre or hectare values.

Distances: allows you to display from zero to six places passed the decimal point for distances.

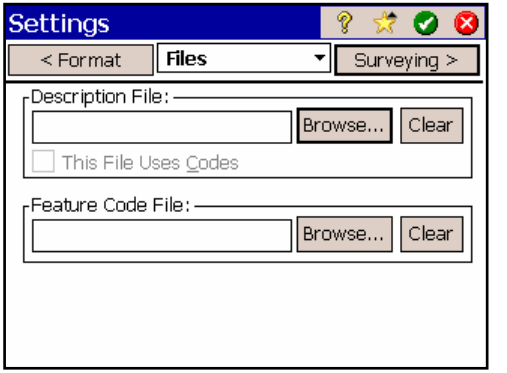
Angles: allows you to include from zero to four fractional seconds with angle values.

Stations: allows you to display stations in any of the following formats:

- 12+34.123: displays stations where the number to the left of the + advances after traveling 100 feet or meters.
- 1+234.123: displays stations where the number to the left of the + advances after traveling 1,000 feet or meters.
- 1,234.123: displays standard distances rather than stations.

Files Settings

Job Settings Files



Description File: allows you to select a description file to use with the current job.

☑ **This file uses codes**: check this box if the description file contains codes and associated descriptions. Leave the box unchecked if the description only contains descriptions (no codes).

Feature Code File: displays the selected feature code file to use with the current job. See the User's Manual for more information on feature codes.

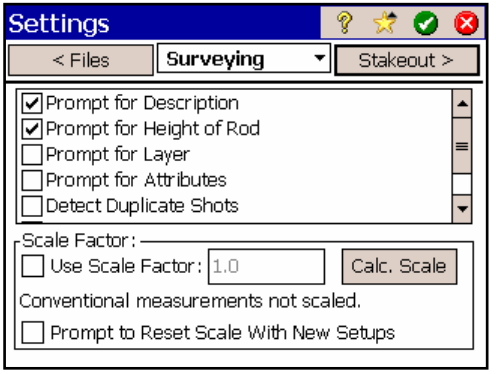
Browse: Allows you to select a file to use with the current job. Simply tap on the filename and then tap Open.

Clear: closes the currently selected file so that it is no longer used with the current job.

Surveying Settings

Job | Settings | Surveying

The Surveying Settings card allows you to select various options that affect how data collection is performed.



☑ **Prompt for Description**: When checked, a prompt for a description will appear before any new point is stored from only the routines under the Survey menu (Page R-117).

Note: Descriptions cannot exceed 16 characters.

☑ **Prompt for Height of Rod**: When checked, a prompt for the rod height will appear before any new point is stored.

☑ **Prompt for Layer**: When checked, a prompt to select a layer will appear before any new point is stored from only the routines under the Survey menu (Page R-117).

☑ **Prompt for Attributes**: When checked, a prompt to select feature information will appear before any new point is stored from only the routines under the Survey menu (Page R-117). This also requires that a feature file be selected from the Files Settings card, described above.

☑ **Detect Duplicate Shots**: when checked, a prompt will appear before attempting to store a second shot to the same location. This helps to catch when robotic total stations have lost lock while surveying. The distance tolerances set in the Repetition Settings screen are used in determining when two shots are at the same location.

☑ **Adjust for Earth Curvature / Refraction**: when checked, the elevations for new points are adjusted to compensate for the curvature of the earth and refraction.

☑ **Survey with True Azimuths**: automates the process of adjusting the circle on the total station when traversing so that you can survey with azimuths rather than horizontal angles (see Page R-127).

☑ **Use Scale Factor**: when checked, horizontal distances to all new points will be scaled by the factor entered here. (Elevations are not affected.) This defaults to unchecked when a new job is created.

Calc. Scale: allows you to automatically compute the scale factor from a selected map projection. If a mapping plane is not already selected, you will first be prompted to select one.

☑ **Prompt to Reset Scale on New Setups**: if checked when a map projection is selected and you set up over a new location, the specified scale factor is compared to the scale factor defined for your current location in the mapping plane. If the scale factor is different, you will be prompted to use the new scale factor.

Stakeout Settings

Job | Settings | Stakeout

The Stakeout Settings card contains the setting that control how stakeout is performed. (The settings available depend on if you are running in conventional or GPS mode.)

☑ **Stake "Corners," Not Just Even Intervals**: when staking by stations, locations where a line segment changes, such as from a straight section to a curve, will also be staked when this is checked.

☑ **Stake Bisector of Non-tangent Corners**: When staking an offset to a centerline that contains a corner, this option, when checked, will stake the corner point where the two offsets intersect.

☑ **Always Start Stakeout With Coarse Mode**: When checked, the EDM mode toggle button found in all stakeout screens will initially be set to coarse mode (fast shot). This instructs the total station to measure distances faster, but with slightly less accuracy.

☑ **Use Manual Updating (Remote Control)**: When this is checked, a Shot button in the stakeout screens must be pressed to take a shot. When this not checked, shots are continuously taken in the stakeout screens. (This is only valid when running in remote mode, using a robotic total station.)

☑ **Design Elevation from Offset Segment**: Determines where the cut/fill value is computed from in the Offset and Road Stakeout screens when the Offset checkbox is checked and a non-zero offset is entered. When checked, the cut/fill value is calculated from the design elevation of the node you are staking to. When unchecked, the cut/fill value is calculated from the design elevation at the specified offset location.

Note: If the specified offset extends beyond the end of the road profile, the cut/fill value is always computed from the design elevation of the node you are staking to.

☑ **Write Cut Sheet Data Only (No Store Point)**: When checked, as-built points are not stored to the JOB file when staking points; only the raw data is written to the RAW file.

☑ **View from Gun to Rod (non-remote)**: When checked, the move left or right information will be presented from the rod person's point of view. When unchecked it will be presented from the total station's point of view. (This option only applies when a robotic total station is selected in the Instrument Settings.)

☑ **View from Rod to Gun (remote)**: When checked, the move left or right information will be presented from the rod person's point of view. When unchecked it will be presented from the total station's point of view. (This option only applies when a non-robot total station is selected in the Instrument Settings.)

☑ **Prompt for Layer**: When checked, a prompt to select a layer will appear before any new point is stored from only the routines under the Stakeout menu.

☑ **Prompt for Attributes**: When checked, a prompt to select feature information will appear before any new point is stored from only the routines under the Stakeout menu. This also requires that a feature file be selected from the Files Settings card, described earlier.

Note: There is no Prompt for Description checkbox as in the Surveying Settings card because you are always prompted for a description when storing a point from a stakeout routine.

Use Perfect Stationing: When checked, staking locations will be computed at perfect stationing intervals. For example, if your starting station was 0+15 and your station interval was 100, your next stakeout location will occur at 1+00 instead of 1+15.

Point Tolerance: this setting affects the Remote Staking routine (Page R-279). When performing Remote Stakeout, the final graphic

screen that is displayed when you are near the stake point will occur when you are within the distance to the stake point specified here.

Line Tolerance: this setting affects the Stake to Line routine (Page R-282). When staking to a line and the prism is located at a perpendicular distance to the specified line that is within the range set here, a message will state that you are on the line.

Horizontal Distance Tolerance: This setting affects the GPS staking routines. When you are within the specified distance to the location you are staking, you are considered on that location.

Turn gun to design point: only applies to motorized total stations. The following options are available:

- 2D (HA only): A motorized total station will turn horizontally toward the design point after tapping the Turn Gun button in the particular stakeout screen.
- 3D (HA and ZA): A motorized total station will turn horizontally and vertically toward the design point after tapping the Turn Gun button in the particular stakeout screen.
- Automatic 2D (HA only): A motorized total station will automatically turn horizontally toward the design point when the stakeout screen opens.
- Automatic 3D (HA and ZA): A motorized total station will automatically turn horizontally and vertically toward the design point when the stakeout screen opens.

Cut Sheet Offset stored: The cut sheet offset information can be stored to the raw data file in either of the following formats when performing any offset staking routine:

- Design Offset: when selected, a cut sheet report will list the design-offset values.
- Actual Offset: when selected, a cut sheet report will list the measured-offset values.

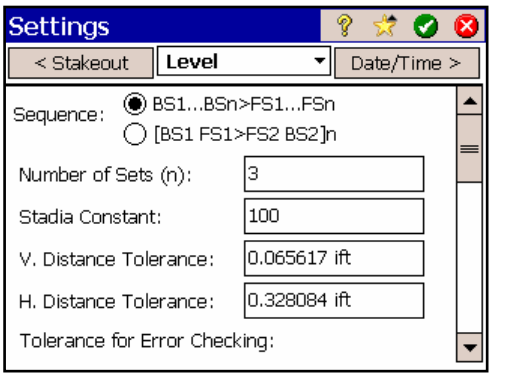
Display Directions As: will guide you to the GPS stakeout location using one of the following formats:

- Northing / Easting: will suggest you Go South/Go North and Go West/Go East
- Distance / Azimuth: will display the necessary Azimuth and Distance to the stakeout location.
- Forward / Back: will suggest you go FORWD/BACK and Go Left/Go Right when you are within 3 meters to the location. When you are farther than 3 meters, a distance and azimuth is used.

Level Settings

Job | Settings | Level

The Level Setting screen is only available when running in leveling mode. It is used to configure all of the settings for performing a level loop. The scroll bar allows you to view additional settings.



BS1...BSn>FS1...FSn: This sequence requires that you take all the shots for each set to the backsight, turn to the foresight, and then shoot all the shots for each set to the foresight.

[BS1 FS1>FS2 BS2]n: A single set in this sequence requires that you shoot the backsight, turn and shoot the foresight, shoot the foresight again, turn and shoot the backsight. Repeat for all remaining sets.

Number of Sets (n): is the number of sets you want to shoot from each setup.

Stadia Constant: is the scale of the upper and lower stadia (wires) in the telescope. The vertical distance measured between these stadia multiplied by the value entered here (usually 100) equals the horizontal distance to the rod.

V Dist Tolerance: is the maximum change in vertical distance that can occur between all the shots to any specific point from a single setup. If this value is exceeded, a warning will occur.

H Dist Tolerance: is the maximum change in horizontal distance that can occur between all the shots to any specific point from a single setup. If this value is exceeded, a warning will occur.

☑ **BS-FS Sight Length < Per Shot**: When checked, a warning will occur whenever the horizontal distance of each leg in any given setup differs by more than this value.

☑ **BS-FS Sight Length < Per Loop**: When checked, the sum of the horizontal distances measured to all the backsight shots are compared to the sum of the horizontal distances to all the foresight shots. If the difference exceeds this value, a warning will occur.

☑ **Max Sight Lengths**: When checked, a warning will occur whenever the horizontal distance measured to any point exceeds this value.

☑ **Min Ground Clearance**: When checked, a warning will occur if a shot is taken at a location on the rod that is within this distance to the ground.

☑ **Max Loop Misclosure**: When checked, the error computed after a level loop is closed will be surrounded with exclamation points in the Close Loop screen and Level Notes screen if the error exceeds this value.

☑ **Upper-Lower Wire Reading <**: When checked a warning will occur if the difference between the upper stadia and crosshair exceeds the difference between the crosshair and lower stadia by this value. (This only applies to the Three Wire level method.)

Load FGCS Defaults: Opens the FGCS Defaults screen, described below, where the default tolerances for a specified level loop order and class can be loaded.

FGCS Defaults

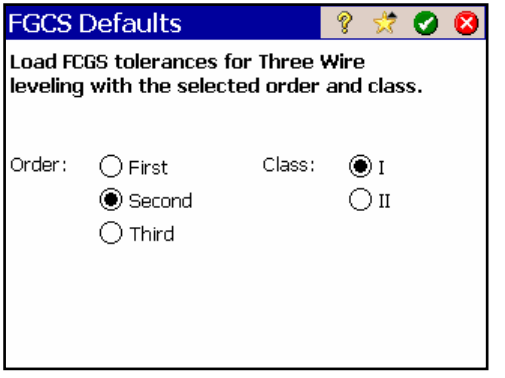
Job | Settings | Level | Load FGCS Defaults

The FGCS Defaults screen is used to load the default FGCS tolerances in the Level Settings screen for the order and class of level loop specified here.

Order: indicates the order of the level loop that you want to load the default tolerances for.

Class: indicates the class of the level loop that you want to load the default tolerances for.

Tapping will load the tolerances into the Level Settings screen based on the FGCS specifications for the order and class selected. (These tolerances can still be manually changed later.)

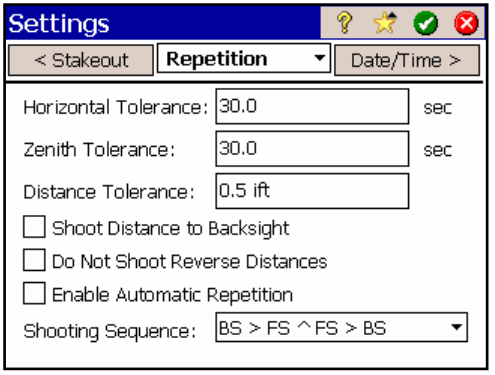


Note: It is important to recognize that Survey Pro can only display a warning if tolerances are not met. It is up to the surveyor to determine if the level loop meets the criteria for a particular standard.

Repetition Settings

Job | Settings | Repetition

The Repetition Settings card contains the settings that control how repetition shots are performed and acceptable tolerances.



Horizontal Tolerance: a warning message will be displayed if a horizontal angle exceeds the tolerance entered here during a repetition shot.

Zenith Tolerance: a warning message will be displayed if a vertical angle exceeds the tolerance entered here during a repetition shot.

Distance Tolerance: a warning message will be displayed if a distance exceeds the tolerance entered here during a repetition shot.

☑ **Shoot Distance To Backsight**: When checked, a distance will be measured to each shot to the backsight. When unchecked, only the angles are measured.

☑ **Do Not Shoot Reverse Distances**: When checked, distances are not measured during reverse shots.

☑ **Enable Automatic Repetition**: When checked, all remaining shots after the first shot to the backsight and foresight will occur automatically when using a motorized instrument.

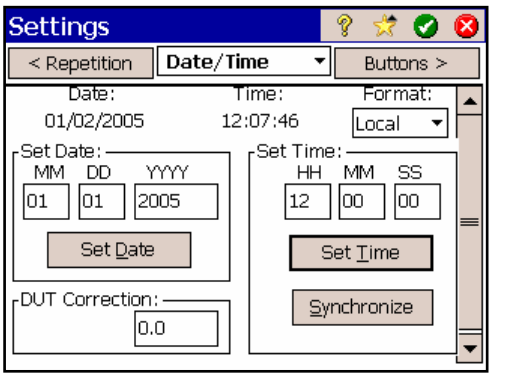
Shooting Sequence: specifies the order that the shots are taken from the following options:

- BS > FS ^ FS > BS: Backsight, Foresight, *flop* Foresight Backsight
- BS > FS ^> BS > FS: Backsight, Foresight, *flop* Backsight, Foresight
- BS ^ BS > FS ^ FS: Backsight, *flop* Backsight, Foresight, *flop* Foresight
- FS ^ FS > BS ^ BS: Foresight, *flop* Foresight, Backsight, *flop* Backsight

- FS > BS ^ BS > FS: Foresight, Backsight, *flop* Backsight, Foresight
- FS > BS ^> FS > BS: Foresight, Backsight, *flop* Foresight, Backsight
- BS ^ BS ^ > FS ^ FS ^: Backsight, *flop*, Backsight, *flop*, Foresight, *flop*, Foresight, *flop*

Date/Time Settings

The Date/Time Settings card is used to set the date and time in the data collector.



Date: displays the current date.

Time: displays the current time.

Format: Select Local to display your local time, or UTC to display Coordinated Universal Time.

Note: The date, time and UTC are computed using Pocket PC's Date/Time properties.

Set Date: will set the system date with the date that is entered.

Set Time: will set the system time with the time entered.

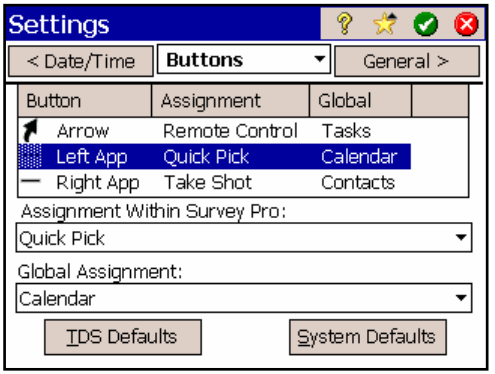
DUT Correction: is the polar wandering correction factor, in seconds, used to convert UTC to UT1. (UT1=UTC+DUT)

Synchronize: when pressed, will zero the fractional portion of the current time and advance to the nearest second so that the time can be set more accurately.

Buttons Settings

This screen is available on the Ranger 300X/500X only.

The Buttons Settings card is used to customize the function for the physical buttons located on the data collector.



The upper half of the screen lists all of the customizable button's current assignments. A particular button must be selected from this list prior to changing its settings from the lower half of the screen.

Assignment Within Survey Pro: is where you select the function for the selected button when it is used within Survey Pro. The function of the button will switch back to its global assignment when it is used outside of Survey Pro. Selecting <Global> from this field will result in the global assignment also being used from within Survey Pro.

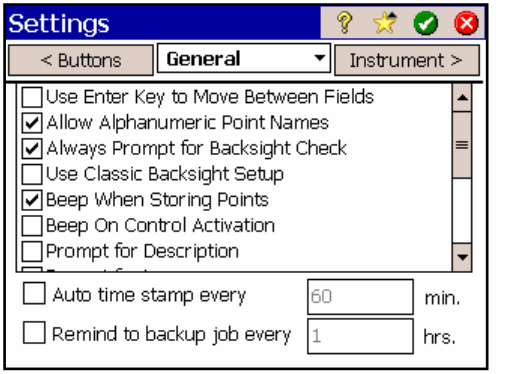
Global Assignment: is where you select the function for the selected button when it is used outside Survey Pro.

TDS Defaults: will set all assignments in the Assignment Within Survey Pro field to the TDS default settings.

System Defaults: will set all assignments in the Global Assignment field to the system default settings and set all the assignments in the Assignment Within Survey Pro field to <Global>.

General Settings

The General Settings card can contain the following miscellaneous settings:



☑ **Use Enter Key to Move Between Fields**: When checked, the [**Enter**] key will move the cursor to the next field in all screens. When unchecked, the [**Enter**] key will perform a different function depending on the field selected.

Note: The arrow keys and the [**Tab**] key can also be used to move the cursor between fields.

☑ **Allow Alphanumeric Point Names**: When checked, you can assign either numeric or alphanumeric names to new points. When unchecked, all point names must be numeric.

☑ **Always Prompt for Backsight Check**: When checked, if you exit the Backsight Setup (Page R-118) screen without performing the Check Backsight routine (Page R-122), a prompt will first ask if you are sure.

☑ **Use Classic Backsight Setup**: when checked, the backsight setup routine functions as it did in versions of Survey Pro before 4.0. Basically the Backsight Solved screen will not appear after solving your backsight. The Check Backsight and Backsight Circle screens can still be accessed manually from the Backsight Setup screen.

☑ **Beep When Storing Points**: When checked, an audible beep occurs when a point is stored.

☑ **Beep On Control Activation**: when checked, a sound occurs when an active area of the screen is tapped, such as a button or checkbox.

☑ **Prompt for Description**: When checked, a prompt for a description will appear before any new point is stored from any routine other than those included in the Survey and Stakeout menus.

☑ **Prompt for Layer**: When checked, a prompt to select a layer will appear before any new point is stored from any routine other than those included in the Survey and Stakeout menus.

☑ **Prompt for Attributes**: When checked, a prompt to select feature information will appear before any new point is stored from any routine other than those included in the Survey and Stakeout menus. This also requires that a feature file be selected from the Files Settings card, described earlier.

☑ **Prompt to Backup When Closing Job**: When checked, a reminder will open to backup the current job prior to closing it.

☑ **Write Point Attributes to Raw Data**: When checked, point feature and attribute information will be written to the raw data file.

☑ **Prompt for Elevation of 2D Cogo Pionts**: when checked, a majority of the COGO routines will prompt you for an elevation before storing a 2D point. When unchecked, 2D points will be stored without the prompt.

☑ **Auto time stamp every ___ min**: When checked, will store a note record to the raw data file containing the current date and time each time the specified number of minutes passes. This is useful for tracking down when specific raw data records were written to the file.

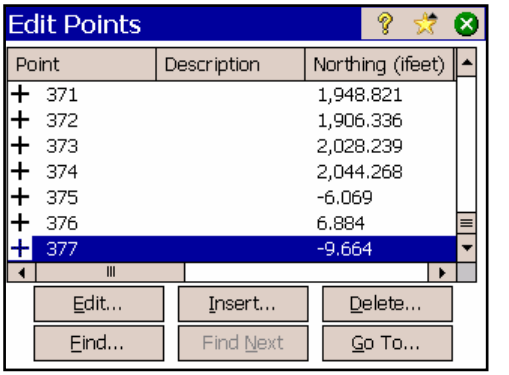
☑ **Remind to backup job every ___ hrs**: When checked, will open a reminder to backup the current job after every specified number of hours passes.

☑ **Log Serial Port Traffic**: When checked, all serial port traffic will be logged to a text file called TDS-Log.txt for troubleshooting purposes and is stored in the Jobs folder. The file is automatically overwritten when logging traffic on a date that is different from the previous date.

Edit Points

Job | Edit Points

The Edit Points screen allows you to add, edit, and delete any points in the current job.



Edit...: if only a single point is selected, this will open the point in the Edit Point - General screen (Page R-60) where the details of the point can be modified. If more than one point is selected, the next Edit Points screen will open where the description and layer for the selected points can be modified simultaneously.

Note: as with most Windows applications, a series of points can be selected by holding down the shift key while selecting the first and last point within a range of points. Miscellaneous points can be selected/unselected by holding down the control key while tapping them.

Note: Double tapping on a point will also open the point in the editor.

Note: The current occupy and backsight points cannot be edited.

Insert...: opens a dialog box where a new point can be added to the current job.

Delete...: will delete the selected point.

Find...: will search for a point by its description.

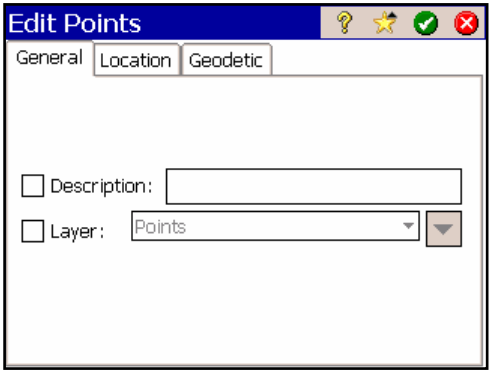
Find Next: will find the next point that contains the description entered when using the Find... button (above).

Go To... : opens a dialog box where any point can be quickly located by the entered point name.

Edit Multiple Points – General

Job | Edit Points | Edit... | General

The General and Location cards of the Edit Points screen are accessed after pressing Edit... when more than one point is selected. The changes made in these screens will be applied to all the selected points.



Change Descriptions: When checked, allows you to change all the selected point's descriptions to the Description entered in the next field.

Description: is the new description that will replace the existing descriptions for the selected points.

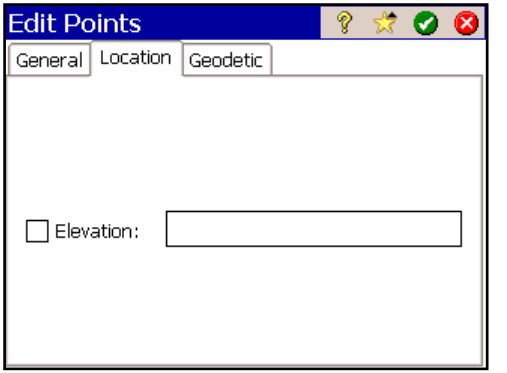
Change Layers: When checked, allows you to move the selected points to the layer selected in the next field.

Layer: is the layer where the selected points will be moved.

Edit Multiple Points – Location

Job | Edit Points | Edit... | Location

Elevation: when checked, this allows you to enter an elevation that will be applied to all selected points.



Edit Point – General

Job | Edit Points | Edit... | General

The General card of the Edit Point screen is used to modify the description, layer and feature information for the selected point.

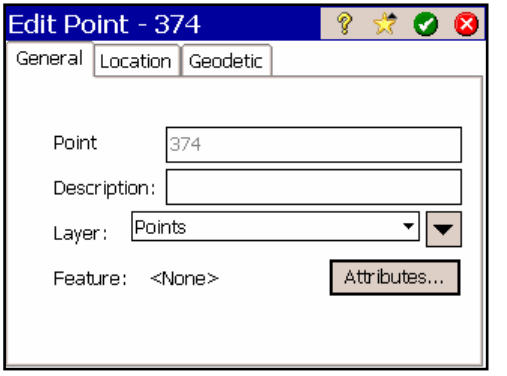
Point Name: displays the selected point's name.

Description: is the description for the selected point.

Layer: is the layer for the selected point.

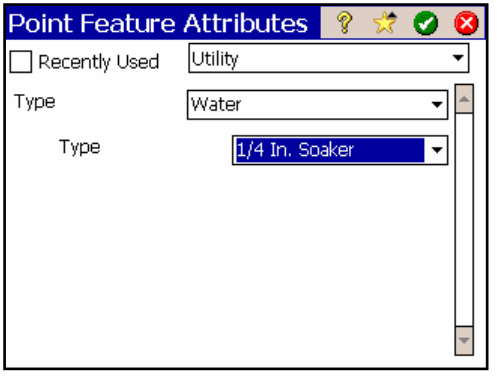
Feature: displays the feature assigned to the selected point, which can be modified using the Attributes button.

Attributes: opens the Point Feature Attributes screen (Page R-61) where the feature attributes for the point can be modified.



Point Feature Attributes

Job | Edit Points | Edit... | General | Attributes...



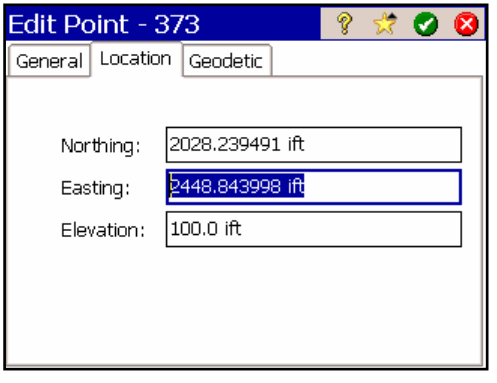
The Point Feature Attributes screen is available from the above path or whenever a point is stored when Prompt for Attributes is checked in the Surveying Settings screen (Page R-45).

Recently Used: when checked will arrange the order of the available features so the most recently used features are listed first. Any feature in the current feature file can be selected from the corresponding drop-down list.

The content displayed in the main portion of the window fully depends on the attribute information associated with the selected feature.

Edit Point – Location

Job | Edit Points | Edit... | Location



The Location card is used to modify the northing, easting and elevation of the selected point.

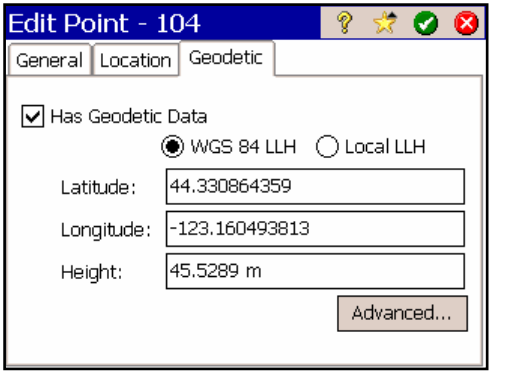
Edit Point – Geodetic

Job | Edit Points | Edit... | Geodetic

The Geodetic card applies primarily to Survey Pro with GPS users. Refer to the GPS Reference Manual for more information on this card.

☑ **Has Geodetic Data**: when checked, this allows you to edit the geodetic coordinates for a point.

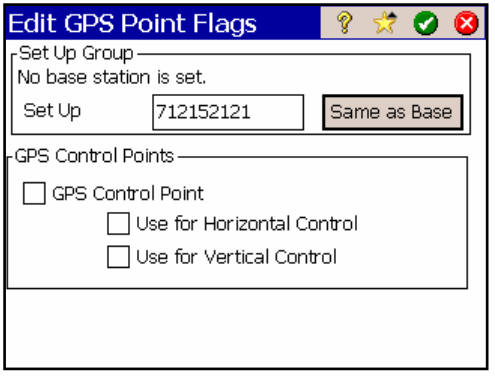
Advanced...: will open the Edit GPS Point Flags screen to select the advanced settings for the selected point.



Edit GPS Point Flags Screen

Survey | Control Points | Edit Point | Set Flags

The Edit GPS Point Flags screen is used to select the advanced settings for the selected point.



Set Up Group: is the set up group of the point. (See the User's Manual for more information on set up groups.)

GPS Control Point: When checked, will include the selected point in the list of localization control points.

Use for Horizontal Localization: When checked, will use the point for horizontal control in the localization solution.

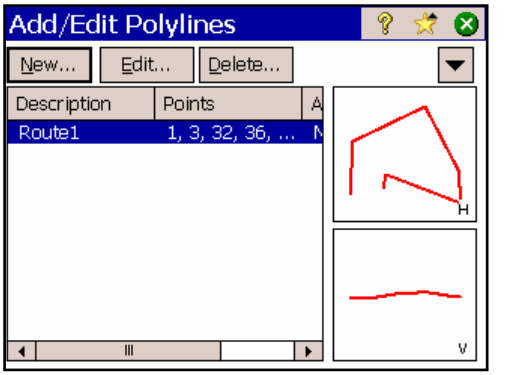
Use for Vertical Localization: When checked, will use the point for vertical control in the localization solution.

: accepts the screen selections and returns to the previous screen.

Edit Polylines

Job | Edit Polylines

The Edit Polylines screen is used to add, edit, and delete polylines in the current job.



The first screen will display a list of all the polylines that are stored in the current job. Selecting any of the polylines listed will display a horizontal (overhead) and vertical (side) view of that polyline.

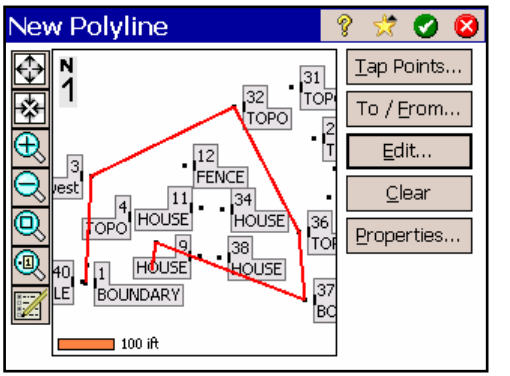
New... : will open the Polyline Editor where a new polyline can be created.

Edit... : will open the selected polyline in the New Polyline screen, described below.

Delete... : will delete the selected polyline.

Screen Two – New Polyline

The second screen is used to define all of the points that are used in the polyline. Any curve information will be entered later, but the end points must still be selected at this point.



The current polyline is shown on color displays with bold red lines and all other polylines are shown using thin black lines. Only the current polyline data can be edited.

Tap Points... : opens a map view where the points in your polyline can be tapped. They must be tapped in the order that they occur in the polyline.

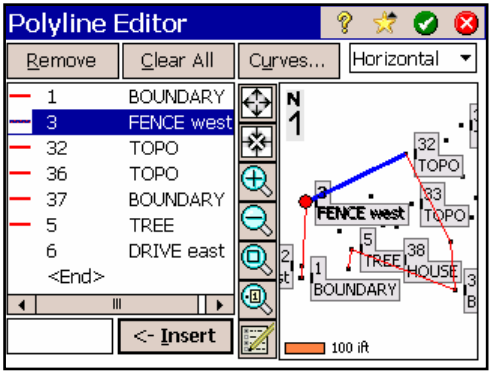
To/From... : Opens the Point List screen (Page R-443) where a point list can be created.

Edit... : Opens the third screen, described next, where the current polyline can be modified.

Clear : removes the current polyline.

Screen Three – Polyline Editor

Once the initial points are selected for the current polyline, the third screen allows you to modify the polyline and define any curve and grade information for the polyline sections.



Selecting any point in the left column of the screen will select that point and the line segment that follows it up to the next point. The selected section is then highlighted in the map portion of the screen. Any edits will occur on the selected section.

Remove : will remove the selected point and the line segment that follows it. The previous line segment will be automatically joined to the following point. The change will only be saved if you then tap ✔. Tapping ✖ will return to the previous screen without saving the changes.

Clear All : will completely remove the current polyline. The change will only be saved if you then tap ✔. Tapping ✖ will return to the previous screen without saving the changes.

Curves... : Opens the fourth screen, described below, where a horizontal, vertical, or spiral curve can be added to the selected polyline segment.

Horizontal / **Vertical**: toggles between showing the map in a Horizontal (overhead) view or a Vertical (side) view.

<- Insert : allows you to insert a point, or a group of points in front of the selected point. The change will only be saved if you then tap ✔. Tapping ✖ will return to the previous screen without saving the changes.

Note, if <End> is selected in the list, the <-Insert button will change to an <-Append button to indicate that additional points will be appended to the end of the list.

Screen Four – Add/Edit Curve

The fourth screen is used to modify a selected polyline segment that occurs between two points. A horizontal, vertical, and/or spiral curve can be applied to the polyline segment.

Adding a Horizontal Curve

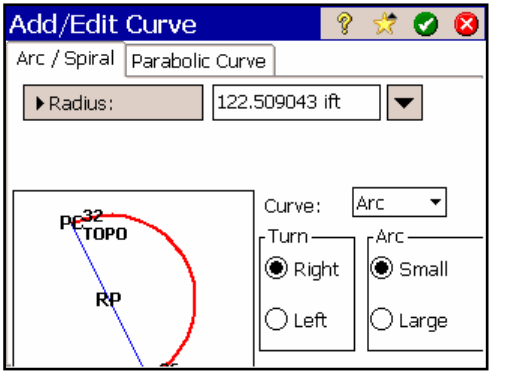
Tap the Arc / Spiral tab.

Curve: must be set to Arc to enter a horizontal curve.

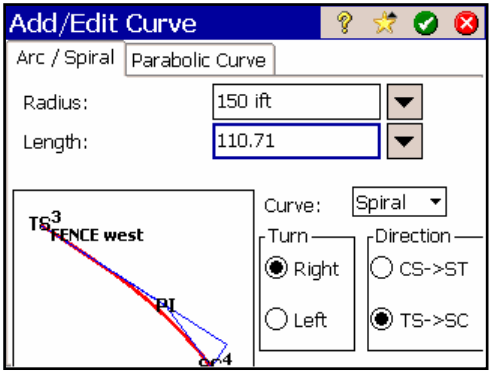
▸Radius | ▸Delta | ▸Degree Arc | ▸Degree Chord: allows you to specify the radius of the curve using a variety of methods.

Turn: specifies if the curve turns toward the Right or Left as you occupy the initial point and face the end point.

Arc: specifies if the arc of the curve is Small (less than 180°) or Large (greater than 180°).



Adding a Spiral



Tap the Arc / Spiral tab.

Curve: must be set to Spiral to enter a spiral curve.

Radius: is the radius of the spiral curve. (The same radius of the circular curve adjacent to the spiral.)

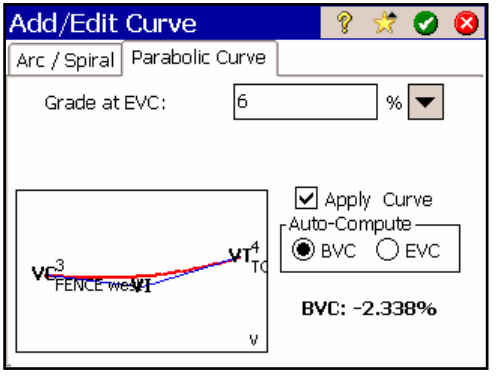
Length: is the length of the spiral, measured along the curve from the TS to the SC.

Turn: specifies if the spiral curve turns to the Right or Left as you occupy the initial point and face the end point.

Direction: specifies if the curve runs from where the tangent intersects with the spiral toward where the spiral intersects with the curve (TS->SC) or if the curve runs from where the curve intersects with the spiral toward where the spiral intersects with the tangent (CS->ST).

Adding a Vertical Curve

Tap the Parabolic Curve tab.



☑ **Apply Curve**: must be checked to enter a vertical at curve.

Grade at EVC / **BVC** is the known grade at either the end of vertical curve or beginning of vertical curve. The grade entered here is determined by the selection made in the Auto-Compute field.

Auto-Compute: will automatically compute the grade at the selected point and display it at the bottom of the screen. The grade at the point that is not checked here must be specified in the field defined above.

Edit Alignments

The Edit Alignments screen is used to create and edit alignments, which can then be used with routines such as Offset Staking, Offset Points, Offset Lines and Road Layout.

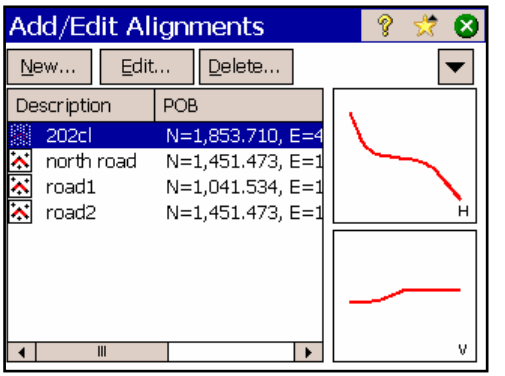
Alignments are used to describe all of the horizontal and vertical details of a road's centerline. An alignment does not use existing points to define any particular locations on the alignment, although a point can be used to anchor the starting location, which is the same location for both the horizontal and vertical parts of the alignment. Any location on an alignment where a change occurs is called a *node*.

An alignment can contain straight sections, grades, horizontal, vertical, and spiral curves. The horizontal and vertical portions of an alignment are defined separately and independently, but they are both combined within the software to create a single alignment with horizontal and vertical characteristics.

Add / Edit Alignments

Job | Edit Alignments or Roads | Edit Alignments

The Add / Edit Alignments screen displays a list of all the existing alignments in the current job. The right portion of the screen shows a graphic of the horizontal and vertical portion of the selected alignment.



New...: opens the Edit Alignment screen where a new alignment can be created from scratch.

Edit...: opens the Edit Alignment screen where the details of the selected alignment can be edited.

Delete...: is used to delete the selected alignment.

▼: The power button opens the following routines:

- **Create Points**: opens the Create Points screen (Page R-440) where points can be stored that coincide with the selected alignment.
- **Import .RD5 File**: opens the Open screen and lists all the *.RD5 alignment files in the Jobs directory. Select the desired file and tap ✔.
- **Export .RD5 File**: opens the Save As screen where the current alignment can be saved to a *.RD5 file.

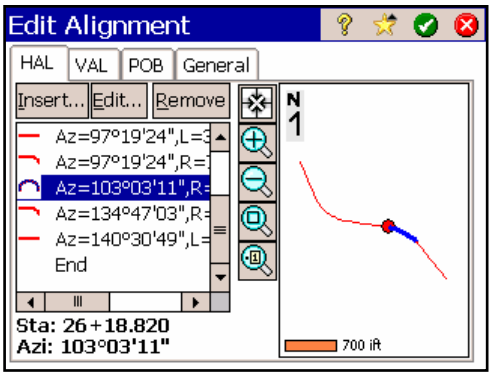
Edit Alignment

Job | Edit Alignments | Edit... or

Job | Edit Alignments | New...

The Edit Alignment screen is used to edit an existing alignment or create a new one.

Edit Alignment Screen – HAL Tab



The HAL (**H**orizontal **AL**ignment) tab in the Edit Alignment screen is used to enter or modify only the horizontal details of an alignment.

Insert...: opens the Edit Segment screen where a new horizontal alignment segment can be inserted prior to the selected segment.

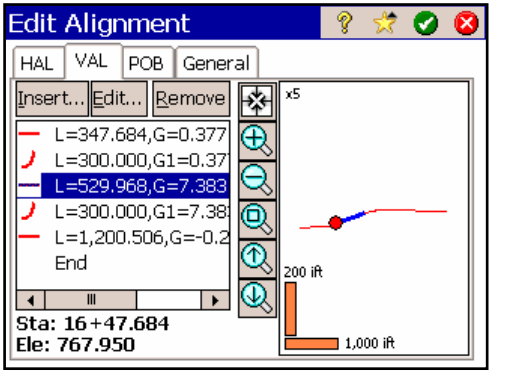
Edit...: opens the Edit Segment screen where the selected horizontal segment can be modified.

Remove: removes the selected segment and automatically joins the next segment with the previous segment.

Note: The station and azimuth at the beginning of the selected horizontal segment are displayed at the bottom of the screen.

Edit Alignment Screen – VAL Tab

The VAL (**V**ertical **AL**ignment) tab in the Edit Alignment screen is used to enter or modify only the vertical details of an alignment.



Note: The total horizontal length of the VAL must be equal to or greater than the total horizontal length of the HAL when the alignment is used for road layout.

Insert... : opens the Edit Segment screen where a new vertical segment can be inserted prior to the selected segment.

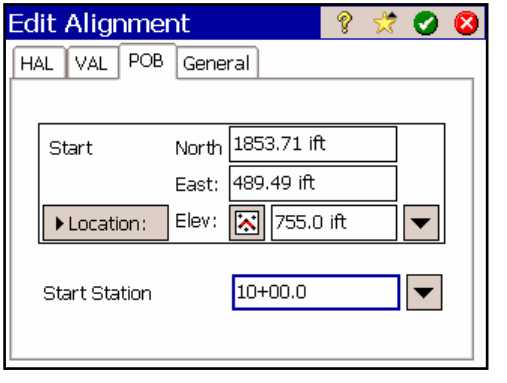
Edit... : opens the Edit Segment screen where the selected vertical segment can be modified.

Remove : removes the selected segment and automatically joins the next segment with the previous segment.

Note: The station and elevation at the beginning of the selected vertical segment are displayed at the bottom of the screen.

Edit Alignment Screen – POB Tab

The POB (**P**oint **O**f **B**eginning) tab in the Edit Alignment screen is used to define the starting location of the alignment. The first horizontal and vertical segment will always begin at this location.

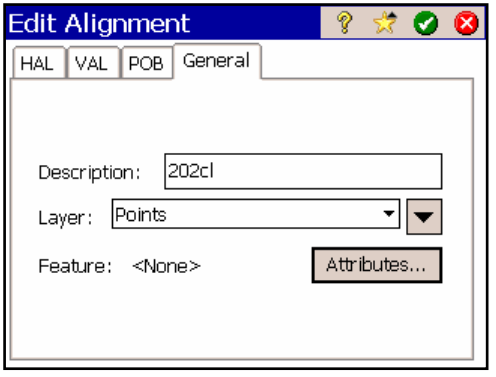


Location : the starting location for the horizontal and vertical alignments will be at the specified North, East and Elev coordinates.

Point : the starting location for the horizontal and vertical alignments will be at the specified Point.

Start Station: is the station on the alignment that corresponds with the starting location or point.

Edit Alignment Screen – General Tab



The General tab in the Edit Alignment screen is used to describe the alignment and select the layer where it is located.

Description: is the description of the alignment.

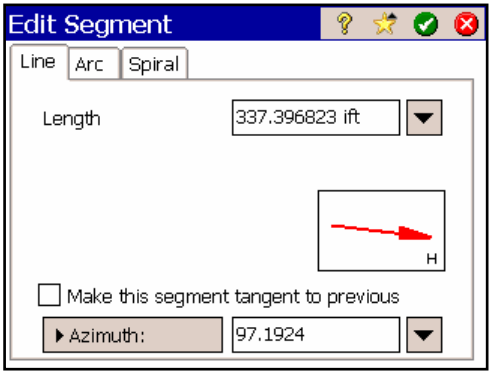
Layer: is the layer where the alignment will be located.

Attributes: opens the Point Feature Attributes screen (Page R-61) where the feature attributes for the alignment can be selected.

Edit Segment

The Edit Segment screen is accessed anytime an existing horizontal or vertical segment is added or edited. A variety of segment editing screens are possible depending on the type of segment being edited or created. Each segment editor is discussed below.

Edit Segment – Line Card



The Line card is used to add a straight horizontal line segment in the alignment.

Length: is the horizontal length of the line.

☑ **Make this segment tangent to previous**: When checked, the specified line will be tangent to the ending tangent of the previous segment.

Note: When making a new horizontal segment tangent to the previous segment, the new segment will appear in the Edit Alignment screen tagged with a **(P)**. This means that if the previous horizontal segment is edited or deleted, where the orientation changes, all subsequent horizontal segments that have the **(P)** tag will also be adjusted so they will remain tangent to the previous segments.

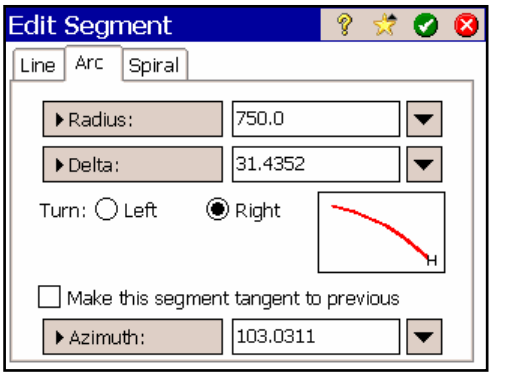
▸Azimuth / ▸Bearing: is used to enter a known azimuth or bearing of the line.

✔: adds the line to the current horizontal alignment.

Edit Segment – Arc (Horizontal Curve) Card

The Arc card is used to add a horizontal curve to the alignment.

The curve can be defined by two of the following:



- Radius: The distance from the radius point to the curve
- Delta: The internal angle from center to tangent points.
- Degree Arc: The internal angle equivalent to a 100-ft arc length.
- Degree Chord: The internal angle equivalent to a 100-ft chord length.
- Length: The arc length.
- Chord: The chord length.
- Tangent: The distance from the PC or PT to the PI.
- Mid Ord: The distance between the curve and the chord at the center of the curve's length.
- External: The minimum distance between the PI and the curve.

Turn: specifies if the curve turns to the ◉ Left or ◉ Right as you face the curve from the beginning.

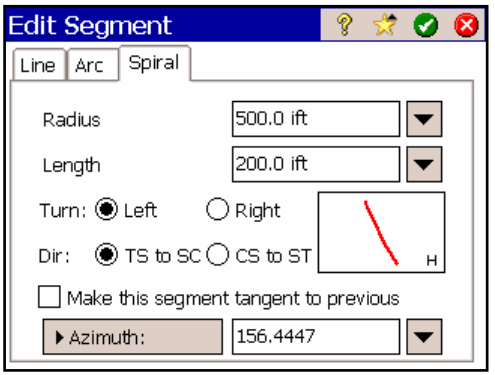
☑ **Make this segment tangent to previous**: When checked, the start of the specified curve will be tangent to the ending tangent of the previous segment.

▸ Azimuth / ▸ Bearing: is used to enter a known azimuth or bearing at the start of the curve.

✔: adds the curve to the current horizontal alignment.

Edit Segment – Spiral Card

The Spiral card is used to add a spiral curve to the alignment.



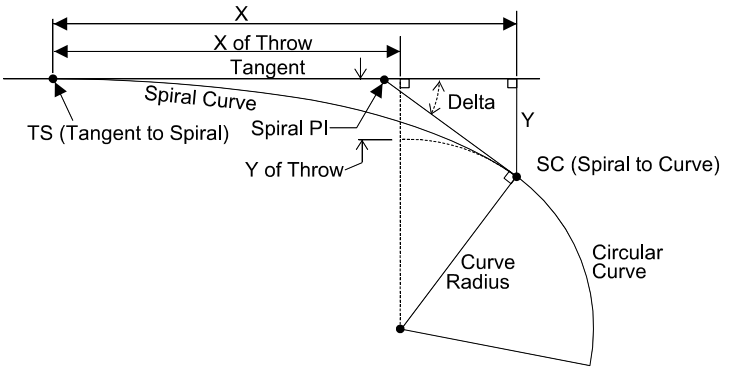
Radius: is the radius of the spiral. (This equals the radius of the horizontal curve tangent to the spiral.)

Length: is the length of the spiral.

Turn: specifies if the curve turns to the ◉ Left or ◉ Right as you face the curve from the beginning.

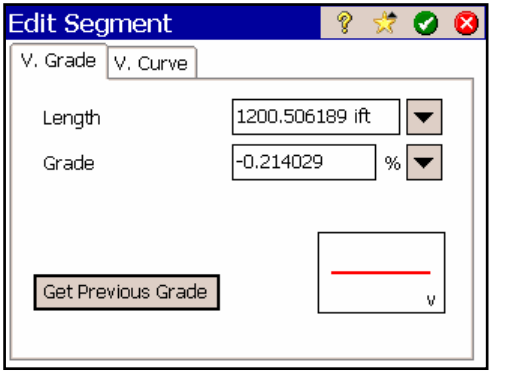
Dir: specifies if the curve runs from ◉ TS to SC (Tangent to Spiral, to Spiral to Curve) or ◉ CS to ST (Curve to Spiral, to Spiral to Tangent).

☑ **Make this segment tangent to previous**: When checked, will automatically turn the spiral so the beginning is tangent to the end of the previous segment.



▸ Azimuth / ▸ Bearing: is used to specify a known azimuth or bearing of the start of the spiral.

Edit Segment – Vertical Line Card (Grade)



The Vertical Line card is used to enter a segment with any grade.

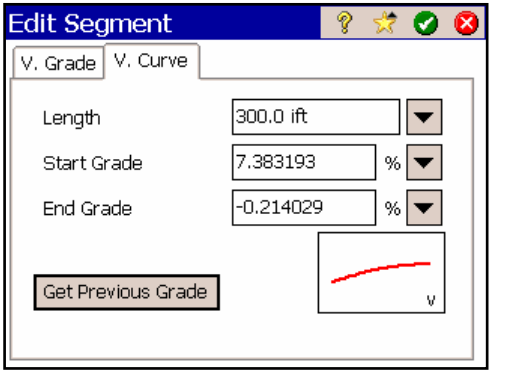
Length: is the horizontal length of the segment.

Grade: is the grade (slope) of the segment.

Get Previous Grade: will automatically enter a grade equal to the grade at the end of the previous segment.

Edit Segment – Vertical Curve

The Vertical Curve card is used to enter a parabolic vertical curve to the alignment.



Length: is the horizontal length of the vertical curve.

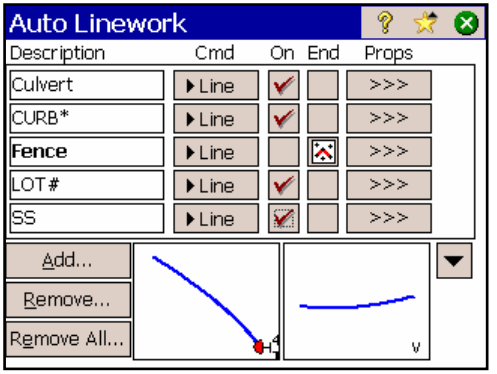
Start Grade: is the starting grade of the vertical curve.

End Grade: is the ending grade of the vertical curve.

Get Previous Grade: will automatically enter a Start Grade equal to the grade at the end of the previous segment.

Auto Linework

Job | Auto Linework



The Auto Linework screen is used to set up custom descriptors that can be used to generate various polylines between points as they are shot. These features can than be exported and used in the TDS ForeSight software.

Note: The auto linework information described below is not written to the raw data file. If using a conversion routine that only uses a raw data file, all linework commands must be manually entered into the raw data file in the form of a note by using the Add Note Quick Pick. (See the User's manual for details on customizing the Quick Pick list.)

Description: lists the descriptions defined from using the Add... button, which when used during data collection, will generate the specified polyline segment (linework).

The following two wildcards can be appended to a description where each one performs a special function.

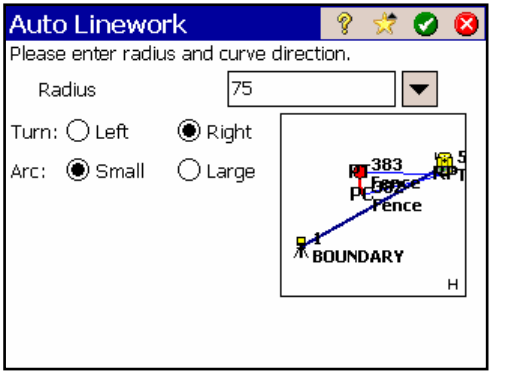
- **Asterisk (*)**: when a description entry ends with an asterisk, any description entered during data collection that begins with the same characters before the asterisk will be joined to the previous linework entry. For example, if CURB* were used as in the screen shown here, and a description for a point was called CURB5 or CURBSIDE, the line segment associated with CURB* would be appended to the previous line segment.
- **Pound sign (#)**: when a description entry ends with a pound sign, any description entered during data collection that begins with the same characters before the pound sign will generate the associated line segment type, but if the next

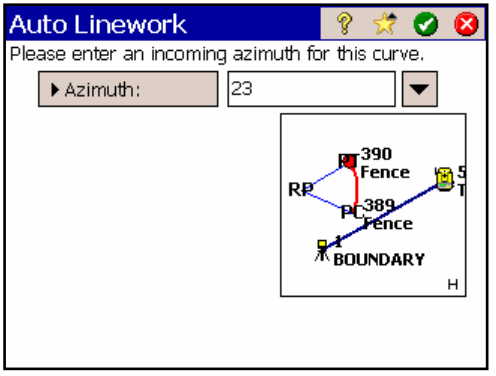
description is at all different from the previous use, a new independent line segment will be drawn. For example, if LOT# were used as in the screen shown above, all entries of "LOT10" would be connected. If LOT15 were also used as a description during data collection, any future use of LOT15 would connect to the previous LOT15 entry.

Note: Linework descriptions are case sensitive.

Cmd: lists the current type of line segment (linework) that will be created after shooting the required points and storing them with the associated Description. The following linework command options are selected by repeatedly tapping the appropriate button:

- ▸ Line: creates a straight line between the next two points stored with a description associated with Line.
- ▸ P-Crv: creates a curve through the next 3 points stored with a description associated with P-Crv.
- ▸ R-Crv: creates a curve between the next two points that are stored with a description associated with R-Crv. After the second R-Crv point is shot, the prompt shown will open and is used to define the details of the curve.





- ▸ T-Crv: creates a curve with a specified incoming tangent from the next two points that are stored with a description associated with T-Crv. When the second point is stored, the prompt shown here appears where the incoming azimuth or bearing is specified.
- ▸ Rect: will compute and store the fourth and final point that forms a rectangle or parallelogram after three points are stored with a description associated with Rect.

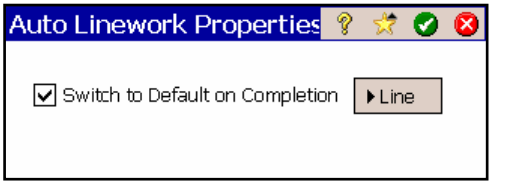
Note: At any time, the line type for any linework command can be changed while collecting linework for a particular feature. For example, a feature called FENCE might primarily use the Line linework command, but might also contain a curved section. To add a curve to the fence, you would use the Ctrl-L Quick Pick to open the Auto Linework screen and toggle Line to R-Crv prior to storing the first point of the curve. Once the second point of the curve is stored, the curve is defined and appended to the FENCE polyline. This routine is enhanced with the Props command, described below.

☑ **On**: When checked, activates the associated linework command. If a particular polyline is created and then this is unchecked for that linework command, future points stored with the same description would not result in any change to that polyline. But if this is then activated again later, all future points collected using the same linework command will be appended to the original polyline.

End: Toggles between the following two functions, giving you control in collecting data for two or more separate features that use the same linework command:

When the map icon is displayed for this button, a polyline has been created for the associated linework command. Tapping the button will then allow you to detach future points using this linework command from the current polyline, resulting in future points being added to a new polyline.

If the button is blank and the current job contains at least one polyline, you will be prompted to select an existing polyline. Once selected, future points stored with this linework command will be appended to the selected polyline.



Props: A single polyline can contain different line types. The Props command will open the Auto Linework Properties dialog box, shown here, where when the checkbox is checked, the linework command will always switch back to the specified default linework command after changing and storing a different line type for a particular feature.

Add...: allows you to create a new linework command.

Remove...: removes the selected linework command.

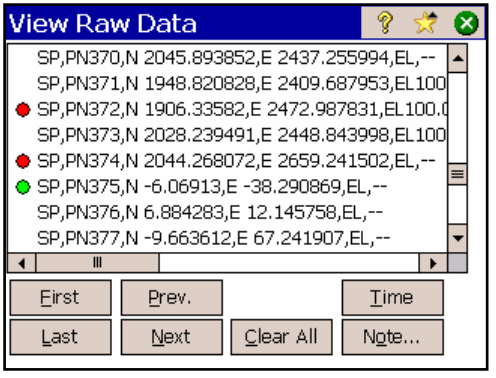
Remove All...: removes all the existing linework commands.

Note: All linework shots require at least two points with a particular linework command before a polyline segment is created. If only the initial point has been stored, no polyline segment is yet created.

View Raw Data File

Job | View Raw Data

The View Raw Data File screen displays the raw data file of the current job and allows you to append a note or current time entry.



Tapping any line in the raw data file will toggle a bookmark in front of that line. The active bookmark is shown as a green circle. An inactive bookmark is shown in red.

First: jumps to the first line of the file.

Last: jumps to the last line of the file.

Prev.: jumps to bookmark above the active bookmark.

Next: jumps to the bookmark below the active bookmark.

Clear All: clears all bookmarks.

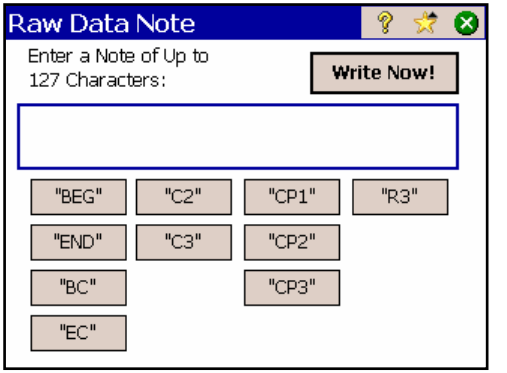
Time: appends the current date and time in the form of a note to the end of the raw data file.

Note...: opens the Raw Data Note screen where any note, up to 127 characters, can be appended to the raw data file.

Raw Data Note

Enter any note to append to the raw data file. You can use the buttons to insert common line work commands.

When finished, tap Write Now! to append the note to the end of the raw data file.



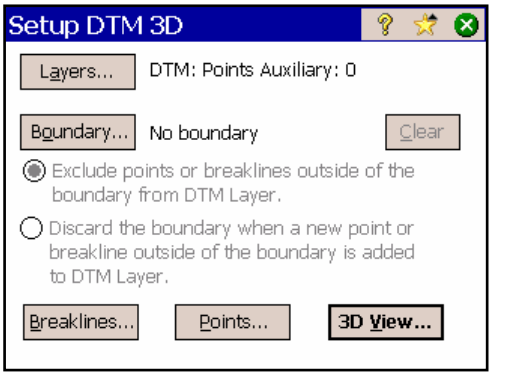
View DTM

Job | View DTM

Before viewing a DTM, the Setup DTM 3D screen will open where the DTM layers must be defined. This screen is also used to define other parameters for the DTM.

Layers: opens the Layers for Staking DTM screen where the DTM layers are selected.

Boundary: opens the Choose Polyline screen where a polyline can be selected that defines the boundary of the DTM.


Setup DTM 3D
Layers...
DTM: Points Auxiliary: 0
Boundary...
No boundary
Clear
Exclude points or breaklines outside of the boundary from DTM Layer.
Discard the boundary when a new point or breakline outside of the boundary is added to DTM Layer.
Breaklines...
Points...
3D View...

Exclude points...: will move any points that exist outside the selected boundary to the Auxiliary layer. If a point is later stored outside the boundary, they will also be moved to the Auxiliary layer.

Discard the boundary...: will initially move any points that exist outside the boundary to the Auxiliary layer. If a point is later stored outside the boundary, the selected boundary is automatically unselected.

Clear: will unselect the selected boundary and move it to the Auxiliary layer.

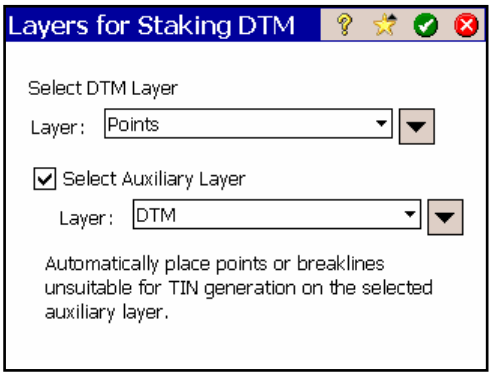
Breaklines... : will open the Add/Edit Break-lines screen where DTM break-lines can be added or edited.

Points... : will open the Points on DTM Layer screen where the points on the DTM layer can be viewed, new points can be imported, and existing points can be deleted (moved to the Auxiliary layer).

3D View... : will open the 3D View screen where the DTM can be viewed from any angle.

Layers for Staking DTM

Job | View DTM | Layers...


Layers for Staking DTM
Select DTM Layer
Layer: Points
Select Auxiliary Layer
Layer: DTM
Automatically place points or breaklines unsuitable for TIN generation on the selected auxiliary layer.

The Layers for Staking DTM screen is used to select the non-reference DTM layer and an optional layer where invalid objects are stored.

Select DTM Layer: is the non-reference DTM layer used for stake points that are stored and other objects that exist on the surface you are staking. These points will be used to generate a DTM surface to compare to the reference DTM surface.

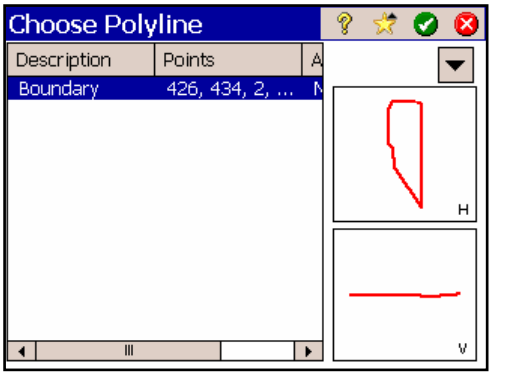
Select Auxiliary Layer: if this is checked and a point is stored that is located outside the selected DTM boundary, the point is automatically stored on the Auxiliary layer. If left unchecked, a prompt will appear when storing a point outside the boundary where you must specify the layer to store the new point.

Layer (Auxiliary): is the layer that all points will be stored to if they cannot be stored to the DTM layer.

Choose Polyline

Job | View DTM | Boundary...

The Choose Polyline screen is used to select an existing polyline that defines a boundary for your non-reference DTM surface.

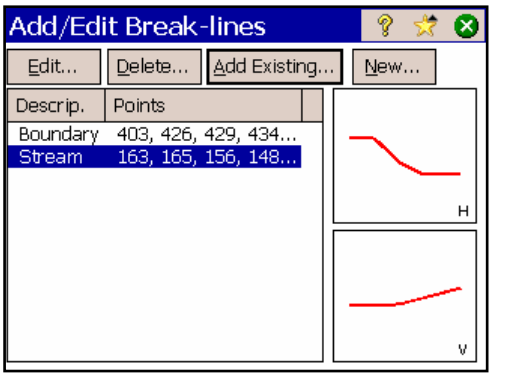


All the polylines in the current job are displayed. Select the appropriate polyline and tap ✔.

Add/Edit Break-lines

Job | View DTM | Breaklines...

The Add/Edit Break-lines screen is used to select, edit, create, or delete the break-lines that will be used when computing the DTM. The break-lines that will be used when computing the DTM are listed in this screen.



Edit...: opens the Edit Polyline screen where the selected polyline can be modified or a new polyline can be created.

Delete...: will move the selected polyline to the Auxiliary layer.

Add Existing...: will display all the polylines in the current job. Selecting a polyline and tapping ✔ will move the selected polyline to the DTM layer.

Note: If a boundary is defined, only polylines that fall within the boundary can be added.

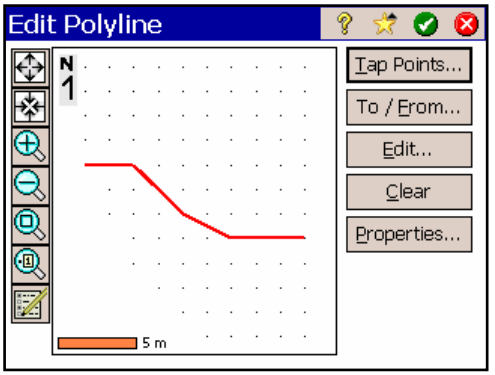
New...: opens the New Polyline screen, which is identical to the Edit Polyline screen and is used to create a new polyline.

Edit Polyline

Job | View DTM | Breaklines... | Edit... or

Job | View DTM | Breaklines... | New...

The Edit Polyline screen is used to perform some preliminary editing to a polyline prior to accessing the polyline editor with the Edit... key.



Tap Points...: allows you to tap points to define a new polyline. If a polyline was already selected prior to accessing this screen, it will be replaced by the polyline being created.

To / From...: allows you to define a range of points that define a polyline. If a polyline was already selected prior to accessing this screen, it will be replaced by the polyline being created.

Edit...: opens the Polyline Editor, described on Page R-65, where the polyline can be further edited.

Clear: will permanently remove the selected polyline from the job.

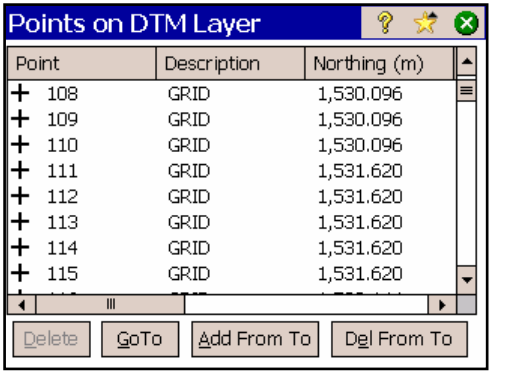
Properties...: opens the New Line dialog box where the description, layer and feature attributes can be modified.

: opens the Map Display Options screen (Page R-443) to select what is displayed on the screen.

Points on DTM Layer

Job | View DTM | Points...

The Points on DTM Layer screen displays all the points on the DTM layer and allows you to add points from another layer or delete (move) points to a different layer.



Delete: will move the selected point(s) to the Auxiliary layer. If the Auxiliary layer is not specified, you will be prompted to select the layer to move the points to.

Note: Points on a boundary or break-line cannot be deleted.

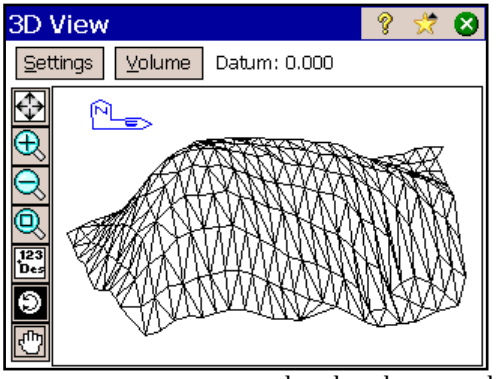
GoTo: will quickly find and select the specified point.

Add From To: opens the Select Point(s) screen where a point range can be entered. The points will then be moved to the DTM layer.

Del From To: opens the Select Point(s) screen where a point range can be entered. The points will then be moved to the Auxiliary layer.

3D View

Job | View DTM | 3D View...



The 3D View screen is used to view the DTM from any angle.

Setting: opens the 3D View Settings screen, described below, where the information displayed in the 3D view can be configured.

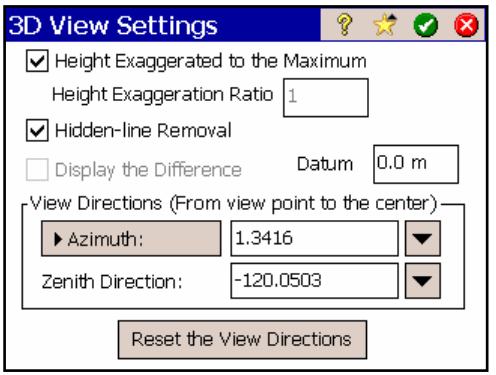
Volume: displays the total cut and fill volume between the area that has been staked and a reference datum, whose elevation is specified in the 3D View Settings screen; or the total cut and fill between the area that has been staked and the selected DTM.

Datum: displays the datum elevation set in the 3D View Settings screen.

: Toggles to display or hide the point names and descriptions.

: When this button is activated (pressed in), dragging within the 3D View will result in the image being rotated to any angle. When the button is not activated, dragging within the 3D View will move the image to any location.

3D View Settings



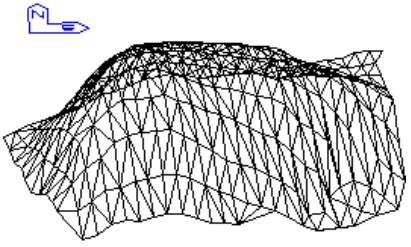
Job | View DTM | 3D View... | Setting

The 3D View Settings screen is used to configure the information displayed in the 3D View screen.

☑ **Height Exaggerated to the Maximum**: When checked, the height exaggeration is automatically set to a high value. When unchecked, the height exaggeration can be set manually in the next field.

Height Exaggeration Ratio: is the value that the height is multiplied by in the 3D view. The higher this value, the more exaggeration, where 1.0 would result in no exaggeration.

☑ **Hidden-line Removal**: When checked, will hide all the lines that occur behind other surfaces in the 3D View. The image shown here is identical to the image shown on Page R-85 except the hidden lines are not removed.



☑ **Display the Difference**: This applies only to DTM stakeout. When checked, the vertical portion (z-axis) of the 3D View screen is computed by the elevation differences between the non-reference DTM surface and the reference DTM surface. This will result in any objects that occur above or below the reference DTM to clearly stand out as hills and valleys and the volume information provided in the 3D View screen will be between the staked points and the reference DTM.

When unchecked, the Datum field can be set to a reference elevation. Cut and fill volumes in the 3D View screen will then be based on the difference of a horizontal plane at the elevation specified here and the non-reference DTM surface.

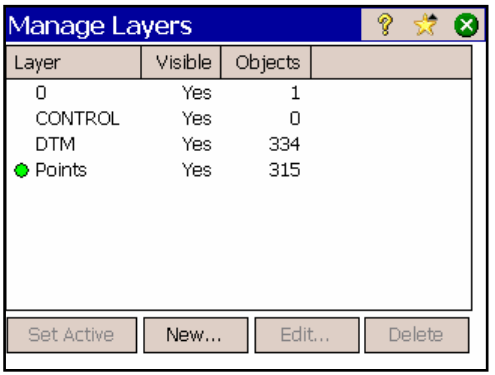
Datum: When the Display the Difference checkbox is unchecked, cut and fill volumes will be computed in the 3D View screen based on the difference of a horizontal plane at the elevation specified here and the staked points.

View Direction (from view point to the center): allows you to specify the exact horizontal and vertical angle in which to view the DTM.

Manage Layers

Job | Manage Layers

The Manage Layers screen is used to manage the layers for the current job. All existing layers are displayed along with which layers are visible and how many objects are on each layer.



Set Active: will set the selected layer as the active layer. The active layer is marked with a ● symbol.

New...: opens the New Layer dialog box where a new layer can be added. You are prompted for a name and if the new layer should be visible.

Edit...: opens the Edit Layer dialog box where the selected layer can be edited. The layer name and visibility can be changed.

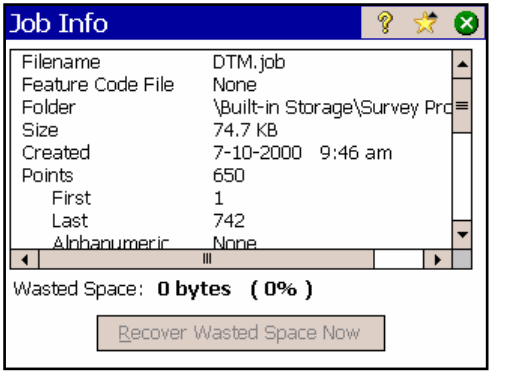
Delete: will delete the selected layer.

Note: Only layers that contain no objects can be deleted. Layer 0 is required and cannot be deleted or renamed.

Tip: To move several points from one layer to another, select the desired points in the Edit Points screen (Page R-57) and tap Edit. Select the layer you want to move them to and tap ✓.

Job Information

Job | Job Info



The Job Information screen displays details of the current job and allows you to remove wasted space in the current job file.

Filename: displays the current job file name.

Control file: displays the control filename used in the current job.

Feature Code File: displays the feature code filename used in the current job.

Folder: displays the directory where the current job file is located.

Size: displays the size of the current job.

Created: displays the date that the current job was created.

Points: displays the first and last point names and if alphanumeric point names are being used.

Lines: displays the number of polylines and alignments that are in the current job.

Roads: displays the number of roads in the current job and the filenames associated with them.

Attributes Collected: displays the number of point and line attributes used in the current project.

Total Storage: displays the total amount of memory that is installed on the data collector.

Available Storage: displays the amount of free memory that is available to use for jobs.

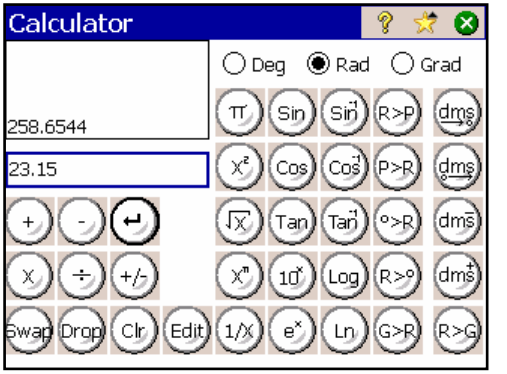
Wasted Space: displays the amount of empty space that is being used by the current job. This space can be recovered as described below.

Recover Wasted Space Now: As you add and remove points and lines in a job, empty gaps can result within the job file. These gaps use storage space. This button will remove any gaps in the job file, thus recovering the wasted space.

Note: Survey Pro checks for low memory situations every minute. When the available system memory falls below 256K of RAM, a warning is displayed.

Calculator

Job | Calculator or ▼, Calculator (where applicable)



The Calculator screen behaves exactly like any other RPN-format calculator. It consists of a stack that can contain any number of values and buttons that perform various operations. When a value is being entered from the keypad, it is displayed in a special area called the active area. This value is then place in Level 1 of the stack after tapping the Enter key.

Tapping a button on the display performs the corresponding operation on either the last value in the display, or the last two values, depending on the operation. Each button is explained below where the value in Level 1 is *x* and the value in Level 2 is *y*.

+: Adds *x* and *y*.

×: Multiplies *x* and *y*.

Swp: Swaps positions of *x* and *y* in the stack.

–: Subtracts *y* from *x*.

÷: Divides *y* by *x*.

Drp: Drops (removes) *x* from the stack.

↵: Moves the active value to Level 1 of the stack, or duplicates Level 1 if there is no active value.

±: Changes the sign of *x*.

Clr: Clears the stack.

Edit: Moves the value in Level 1 to the active area where it can be edited.

π: Enters 3.141592654 to the stack.

x^2: Squares *x*.

√x: Square root of *x*.

x^n: Raises y to the power of *x*.

1/x: Inverse of *x*.

Sin: Sine of *x*.

Cos: Cosine of *x*.

Tan: Tangent of *x*.

10^x: Raises 10 to the power of *x*.

e^x: Raises 2.718281828 to the power of *x*.

Sin^{-1}: Arc sine of *x*.

Cos^{-1}: Arc cosine of *x*.

Tan^{-1}: Arc tangent of *x*.

Log: Common logarithm (base 10) of *x*.

Ln: Natural logarithm (base e) of *x*.

R>P: Converts the rectangular coordinates (*y*,*x*) to polar coordinates.

P>R: Converts the polar coordinates (*y*,*x*) to rectangular coordinates.

°>R: Converts *x*, in decimal degrees to radians.

R>°: Converts *x*, in radians to decimal degrees.

G>R: Converts *x*, in Grads to radians.

dms→°: Converts *x*, in degrees.minutes-seconds to decimal degrees.

°→dms: Converts *x* in decimal degrees to degrees.minutes-seconds.

dms –: Subtracts *x* in degrees.minutes-seconds from *y* in degrees.minutes-seconds.

dms +: Adds *x* in degrees.minutes-seconds and *y* in degrees.minutes-seconds.

R>G: Converts *x*, in radians to Grads.

Job Menu – GPS

Only the Settings menu item in the Job Menu is unique while running in GPS mode with the standard GPS module compared to running in Conventional mode. All the remaining Job Menu items are covered in the Job Menu description for conventional surveying, starting on Page R-35.

A: Settings

B: Edit Points

C: Edit Polylines

D: Edit Alignments

E: Auto Linework

F: View Raw Data File

G: View DTM

H: Manage Layers

I: Job Information

J: Calculator

Settings

Job Settings

The Settings screen opens several individual screens that control all hardware and software settings. The screens are provided in an index card format.

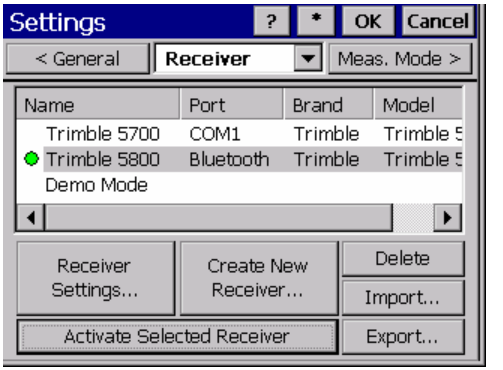
Note: Only the cards that are available when running in GPS Mode with the GPS module are covered in this section. For details on cards shared by both GPS Mode and Conventional Mode, refer to Page R-36.

Receiver Settings

Job Settings Receiver or

Connect to Receiver Receiver Settings

The Receiver Settings card is used to select and activate GPS receivers, as well as modify or create a receiver's settings parameters.



The upper portion of the first Receiver Settings screen lists the names of all the receiver profiles on the data collector. The other columns list the COM Port, Brand, and Model of the receiver defined in each profile.

Demo Mode: is a special profile that cannot be deleted or edited. When activated, Survey Pro is put into Demo Mode which can be used to simulate GPS measurements. This mode is used for training and demonstration purposes.

Receiver Settings...: opens the Receiver Setup screen where you can set the parameters for communication from data collector to receiver, as well as access the Rx Settings screens where you can configure the receiver settings.

Create New Receiver...: opens the Receiver Setup screen where you can set the parameters for communication from data collector to receiver, as well as access the Rx Settings screens where you can configure the receiver settings. When you tap OK, the new receiver is added to your list of known receiver.

Activate Selected Receiver: makes the selected receiver the currently active receiver in Survey Pro.

Delete:Deletes the selected receiver profile from the list of known receivers.

Import: imports an receiver profile from a file that was previously loaded on the data collector

Export: saves the selected receiver profile to a file, which can then be transferred to another data collector and then imported.

Receiver Setup

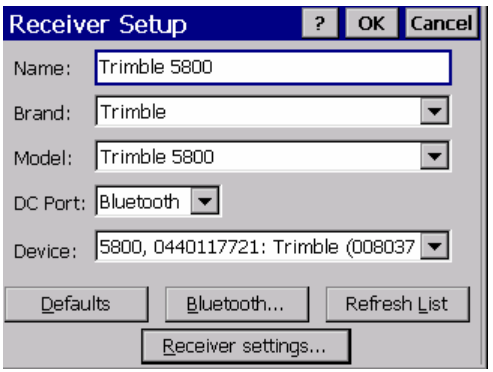
Job Settings Receiver Receiver Settings... or

Job Settings Receiver Create New Receiver... or

Connect to Receiver Receiver Settings or

Connect to Receiver Create Receiver...

The Receiver Setup screen is used to create or modify a receiver profile.



Name: The name of the receiver to appear in your known receiver list.

Brand: The brand of this receiver.

Model: The model of this receiver

Data Collector Port: The data collector port used to communicate with the receiver.

Note: Some receivers support Bluetooth wireless communication. If the data collector is set to use Bluetooth, then the next two settings are hidden.

Baud Rate: the baud rate used for data collector to receiver communications.

Parity: the parity used for data collector to receiver communication.

Defaults: sets the communication parameters to the default for this brand and model.

Autodetect: attempts to communicate with the receiver on each available COM port and at every available baud rate and parity. If successful, it will update the communication parameters to the discovered values. This button only shows when your Data Collector Port is set to COM1 or COM2.

Bluetooth...: opens the Bluetooth control panel application. This separate application is used to scan for Bluetooth receivers and select devices to use with Survey Pro. This button only shows when your Data Collector Port is set to Bluetooth.

Set Rx Comms: sets the receiver with the communication parameters from this screen. In order to use this function, you first must know the correct communication parameters in Survey Pro. This is usually accomplished by using the Autodetect function. Once you have established communication with the receiver, you can choose new parameters and tap Set Rx Comms to change the settings on the receiver. This button only shows when your Data Collector Port is set to COM1 or COM2.

Rx Settings: connects to the receiver using the selected communication parameters, and opens the Rx Settings screen.

Device: is where you set the Bluetooth device to connect to.

Refresh List: refreshes the Device list with all available Bluetooth devices known to the Bluetooth control panel application. You must hit Refresh List in order to update the Device list with any Bluetooth receivers you found using the control panel application scan function since you have opened the Receiver Setup screen.

Rx Settings

Job | Settings | Receiver | Receiver Settings... | Rx Settings or

Job | Settings | Receiver | Create New Receiver... | Rx Settings or

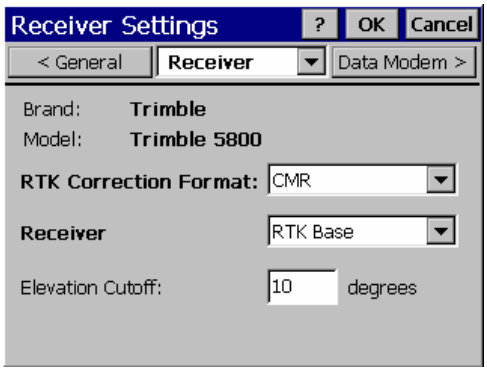
Connect to Receiver | Receiver Settings | Rx Settings or

Connect to Receiver | Create New Receiver | Rx Settings or

The Rx Settings screen contains three cards to configure the receiver mode, RTK correction type, RTK data modem, satellite tracking elevation cutoff, as well as some settings specific for particular brands and models of receiver.

Receiver Settings

The Receiver card is used to set the mode of the receiver, the correction format for RTK receivers, and the elevation cutoff for satellite tracking.



Brand: displays the receiver manufacturer selected in the Receiver Setup screen.

Model: displays the receiver model selected in the Receiver Setup screen.

RTK Correction Format: is where you set the format for communication between the base and rover.

Receiver Mode: is where you set the mode of operation of this receiver. There are four choices:

- RTK Base: use this mode to set the receiver as an RTK base, which will broadcast GPS corrections in the selected RTK Correction Format over the transmitting data modem.
- RTK Rover: use this mode to set the receiver as an RTK rover, which will listen for GPS corrections on the receiving data modem, and calculate a differential GPS position in real time.
- Post Processing: use this mode to set the receiver to collect GPS raw data for post processing. No data modem will be used to

transfer GPS measurements in real time. This mode is used to setup both static and stop/go post processing receivers.

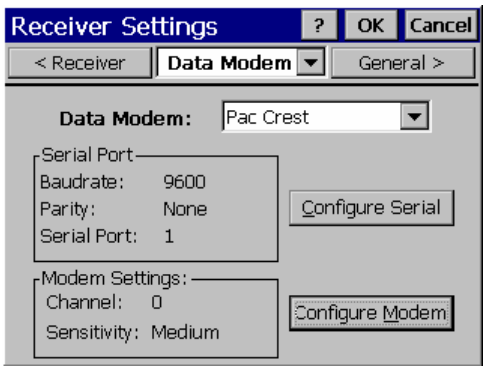
- Ntrip Rover: Select this mode to use the receiver as an RTK rover where the base corrections are to be supplied to the rover by connection to an Ntrip service. To configure an Ntrip rover, you must setup the Windows Networking modem parameters on the Data Modem card.

Note: You do not need to select the RTK Correction Format for an Ntrip rover because this will be determined by the Ntrip service you pick at rover setup time.

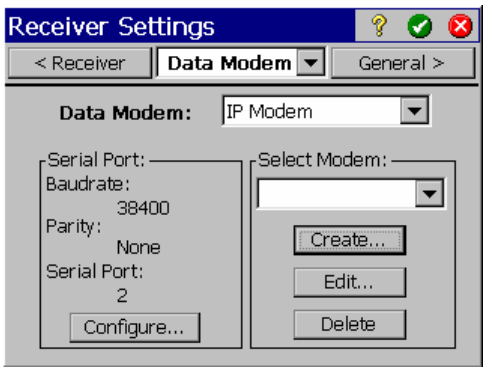
Elevation Cutoff: is where you set the elevation cutoff for satellite tracking. This value will be set in the receiver the next time you configure it as a base, rover, or static receiver.

Data Modem Settings

The Data Modem card is used to view and configure the settings for the modem used to transmit RTK base corrections or receiver RTK rover corrections. The data modem card is not used when your Receiver Mode is set to Post Processing



Pac Crest or OEM Radio



Cell Phone or IP Modem

Data Modem: is where you select the type of modem. There will be several options here, depending on your brand and model. If the

modem you are using is not in the list of known devices, you can choose Generic Serial to set the communication parameters to work with just about any external data modem.

Serial Port: displays the current settings for communication between the receiver and the modem. This includes:

Baud Rate: displays the baud rate the receiver will use to communicate with the modem.

Parity: displays the parity the receiver will use to communicate with the modem.

Serial Port: displays the serial port the receiver will use to communicate with the modem.

Note: The following settings will vary depending on your choice of modem. You may see one of the following:

Configure Serial / Configure...: Opens the Modem Serial Comms. screen (Page R-100), where you can change the settings for communication between the receiver and the data modem.

Modem Settings: Displays the settings last used by Survey Pro for this modem type. This includes:

Channel: Displays the last radio channel when applicable.

Sensitivity: Displays the last radio sensitivity when applicable.

Mode: Displays the last radio base mode when applicable.

Configure Modem: Establishes communication with the radio firmware and opens the Radio Settings screen (Page R-100), where you can change the radio channel and sensitivity settings.

Select Modem: Allows you to select an existing data modem configuration for your cell phone or IP modem. (IP modem is only available when RTK Rover is selected for the receiver.)

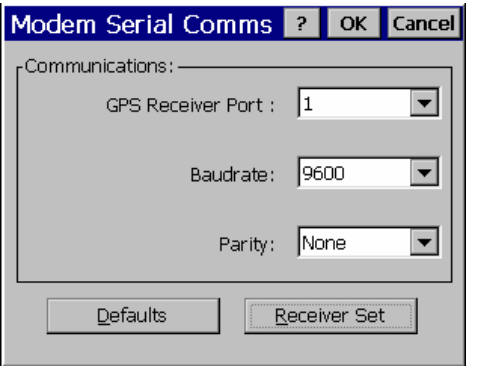
Create: Opens the Cell Phone Settings or IP Modem Settings screen (Page R-102 or R-103, respectively) depending on if Cell Phone or IP Modem is selected for the Data Modem where a new data modem configuration can be created.

Edit: Opens the Cell Phone Settings or IP Modem Settings screen (Page R-102 or R-103, respectively) where the selected data modem configuration can be modified.

Delete: Deletes the selected data modem configuration.

Modem Serial Comms Screen

The Modem Serial Comms. screen is used to change the settings for communication between the base or rover receiver and the data modem.



GPS Receiver Port: is where you select the serial port the receiver will use to communicate with the modem.

Baudrate: is where you select the baud rate the receiver will use to communicate with the modem.

Parity: is where you select the parity the receiver will use to communicate with the modem. This setting disabled for receivers that do not support user defined parity setting.

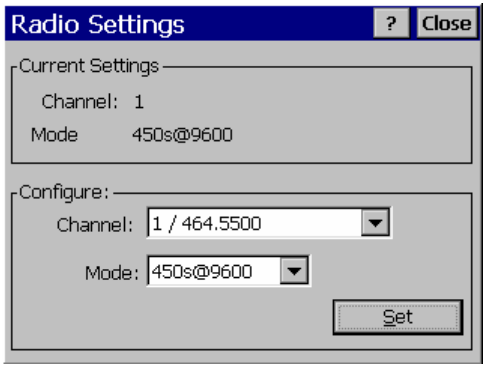
Defaults: automatically sets all the selectable values to their defaults based on the current receiver hardware.

Receiver Set: sets the selected modem communication settings for the specified port on the receiver.

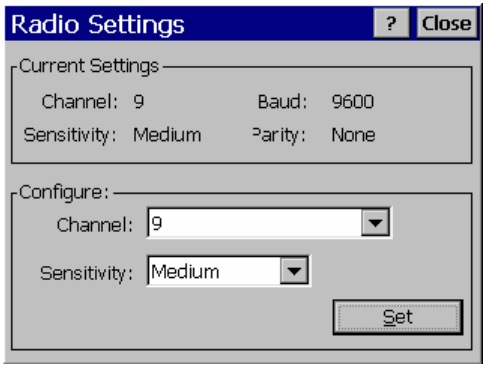
Note: The modem communication settings are also set in the receiver during the base and rover setup procedure. Therefore, you will not usually have to use the Receiver Set button on this page.

Radio Settings Screen

The Radio Settings screen is used to configure settings of the base or rover radio modem. All settings available are described below. However, not all radios support all of the described settings, so if you do not see one of these fields, it is because the radio type does not support it.



Trimble Internal Radio



Pac Crest Radio

Channel: is where you select the channel the radio will use to communicate with the other radio.

Sensitivity: is where you select the sensitivity of the radio.

Mode: is where you select the transmit format used by the base radio. The rover radio must be listening for same format the base is broadcasting.

Baud: displays the baud rate the radio is currently set to. There is no way for Survey Pro to change this value, so you must set the receiver to radio communications to match what you see here.

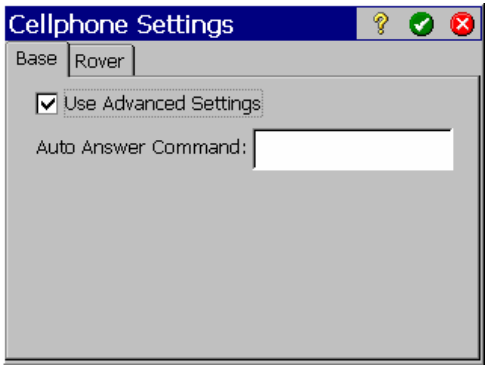
Parity: displays the parity the radio is currently set to.

Set: sends commands to the radio firmware to configure the settings selected on this screen.

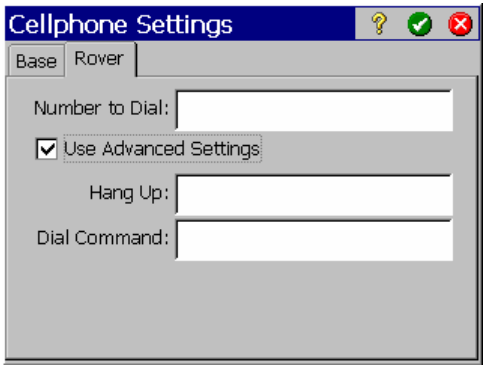
Note: some settings on the radio cannot be modified with Survey Pro. To fully program the radio modems, you need to PC software that should be supplied with the radio.

Cell Phone Settings Screen

The Cell Phone Settings screen is used to create or modify a cell phone data modem configuration.



Cell Phone Settings – Base Card



Cell Phone Settings – Rover Card

Use Advanced Settings (Base Card): When checked, allows you to specify alternate Hayes AT auto answer command. If unchecked, the default AT auto answer command of **`ate0s0=1`** is used.

Auto Answer Command: is the alternate Hayes AT command to use for auto answering.

Number to Dial: is where you enter the telephone number of the RTK base receiver's cell phone.

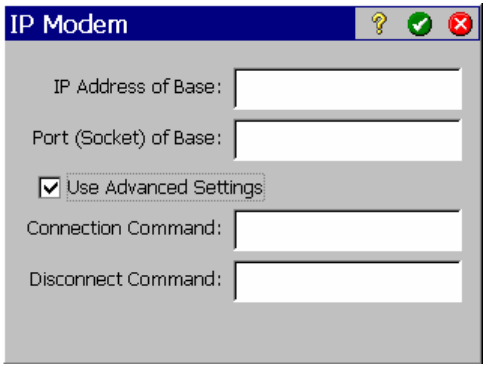
Use Advanced Settings (Rover Card): When checked, allows you to specify alternate Hayes AT commands to hang up and dial. If unchecked, the default AT command to hang up of **`ath0`** and the default AT command to dial of **`ate0dt`** (followed by the Number to Dial) will be used.

Hang Up: is the alternate Hayes AT command to use for hanging up.

Dial Command: is the alternate Hayes AT command to use for dialing.

IP Modem Settings Screen

The IP Modem Settings screen is used to create or modify an IP modem configuration. (You can only configure in IP modem when RTK Rover is selected for the receiver.)



IP Address of Base: is the IP address of the base.

Port (Socket) of Base: is the socket number of the base.

Use Advanced Settings: When checked, allows you to specify alternate Hayes AT commands to connect and disconnect. When unchecked, the default connect command of **`ate0&d0dt`** and disconnect command of **`ath0`** will be used.

Connection Command: is the alternate Hayes AT command used to connect.

Disconnect Command: is the alternate Hayes AT command used to disconnect.

General Settings

The General Settings card is used to configure settings specific to each brand and model. Models which have special settings available are described below.

Settings For Trimble Receivers:

Store post process file to: is where you choose the location of the post processing file. Choices are:

- Receiver memory
- Data Collector

Note: This setting is only available when your receiver model is 5700, 5800, R7, R8.

Settings for Thales (Ashtech) Receivers

// reference Z family documentation available at: ftp://ftp.thalesnavigation.com/Reference%20Manuals/Z-Xtreme/Z family.pdf

Canopy: is where you set a parameter to describe the multi-path environment. This command is relevant for ROVER mode or RVP. Choices are:

Open Sky (default)

Under Canopy (forest, urban canyon)

Confidence Level: is where you set the confidence level for ambiguity fixing. The values here are the statistical confidence level in percent. The higher the confidence level, the more certainty that the ambiguities are fixed correctly, but the longer it will take to fix them. The choices are:

- 99.0%
- 99.9%

Settings for Topcon (Javad) Receivers

// reference GPS Receiver Interface Language (GRIL) documentation v 2.3 available at http://www.topcongps.com/support/manuals.html#gril

Co Op Tracking: is where you set the 'common loops' mode of the receiver. For more information on 'common loops' mode, see http://www.topcongps.com/images/coop_tracking.pdf. There are two choices:

- Off
- On

Multi Path Reduction: is where you set to use C/A code phase multipath and C/A carrier phase multipath reduction. This feature is only applicable if your receiver has the "_MRP" option enabled. There are two choices:

- Off
- On

Confidence Level: is where you set the statistical criteria to use in the RTK engine's fixed ambiguity resolution algorithm. The settings of 'Low', 'Medium', and 'High' correspond to confidence levels of %95, %99.5, and %99.9 respectively. There are three choices:

- Low

- Medium
- High

Note: It is recommended you set this value to High. This will usually mean the RTK engine may take longer to resolve a fixed position. It might even mean not being able to resolve a fixed solution in some situations. However, the consequence of a lower confidence level is that it makes it more likely to resolve an incorrect fixed ambiguity. The results of using an incorrect fix are usually much worse than the results of using a float solution.

Antenna: is where you set the source for antenna input. There are two choices:

- Internal
- External

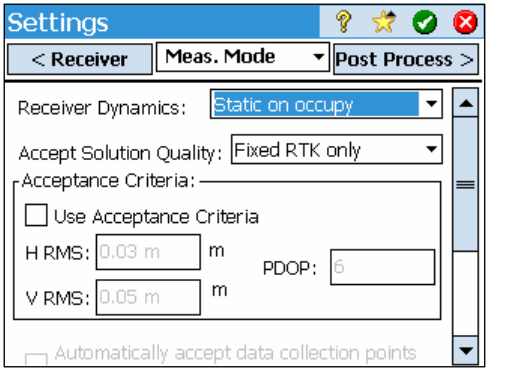
Note: This setting is only available when your receiver model is Hiper.

Set Rx. To OFF mode: Disables all RTK operation (base and rover) and puts the receiver into a standalone autonomous position mode.

Measure Mode Settings

Job | Settings | Measure Mode

The Measure Mode card is used to configure the RTK data collection settings.



Receiver Dynamics: is where you control the receiver dynamics for point occupations. There are two choices

- **Static on occupy**: On starting a point occupation, receiver is put in static mode where it calculates position assuming no motion and applies advanced averaging techniques for the most precise solution.
- **Dynamic always**: Receiver is left in dynamic mode for all point occupations.

Accept Solution Quality: is where you control the solution quality acceptable for storing measurements. You have two options:

- **Fixed RTK only**: Allows storage of fixed solution only.
- **Code, Float, or Fix**: Allows storage of any differential solution.

Acceptance Criteria: is where you select to apply criteria to measurement acceptance. When checked, only measurements with RMS and/or PDOP values below the threshold will be accepted. To use less than all three criteria, check this box but enter 0.0 for the criteria you do not wish to apply.

- **H RMS**: is the horizontal RMS threshold for automatic acceptance or warning on point acceptance.
- **V RMS**: is the vertical RMS threshold for automatic acceptance or warning on point acceptance.
- **PDOP**: is the PDOP threshold for automatic acceptance or warning on point acceptance.

Automatically accept data collection…: is where you select to automatically accept data collection points when the criteria are met. When checked, both the data and Offset Shots screens will automatically accept points once the measurement is better than the specified criteria. Data collection routines will always collect at least 5 seconds worth of data before automatically accepting points based on criteria.

Epoch Averaging: is where you set a number of epochs to average in Survey Pro. If this number is greater than one, Survey Pro will use the number of epochs specified to calculate the final position using a simple (non weighted) average.

Note: This function is not appropriate for every receiver. Some receivers, when dynamics are set to 'static', use Kalman filtering and other superior techniques to calculate an average position. In this case, the position returned from the receiver is better with each epoch and you may actually degrade your result by averaging with Survey Pro. You should check with your receiver manufacturer for specific recommendations on field procedure.

Post Process Settings

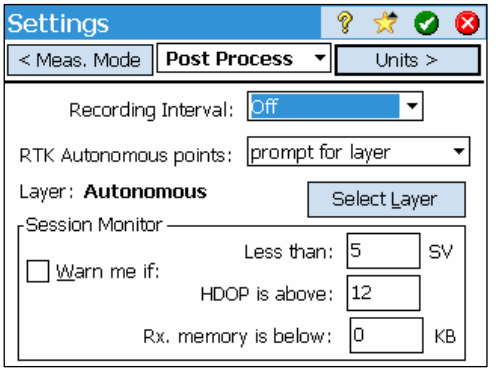
Job | Settings | Post Process or

Connect to Receiver | Receiver Settings

The Post Process card is used to configure the settings for logging post processing data, and the collecting and storing of post processing points in Survey Pro.

Recording Interval: is where you set the period for logging GPS raw data for post processing. Set it to Off to disable post processing data collection in Survey Pro.

RTK Autonomous Points: is where you specify action to take when accepting autonomous points during RTK data collection. There are three options.



- **Do not store**: this option will prohibit acceptance of autonomous points in RTK data collection routines.
- **Prompt for layer**: this option will prompt the user whenever an autonomous point is accepted. The layer specified will be the default layer to store autonomous points, but the user can over ride at the prompt.
- **Store on selected layer**: this option will automatically store autonomous points accepted during RTK data collection routines on the specified layer.

Layer: displays the layer selected to store autonomous points.

Select Layer: opens up a layer prompt to allow you to select an existing layer or create a new layer to store autonomous points.

Session Monitor: is where you select to use the session monitoring thresholds when collecting data with the Static / Rover Session screen. To have Survey Pro display warnings during post processing data collection, check Warn me if, and specify threshold values for the number of SV, HDOP and memory.

Job Menu – Basic GPS

This section describes the Settings menu item from the Job Menu for the Basic GPS Module. See Page 93 for a description of the Job Menu for when running in GPS mode with the standard GPS module.

Only the Settings menu item in the Job Menu contains screens that are unique to the Basic GPS module. References are given for all the other Settings screens that are documented elsewhere in the manual. All the remaining Job Menu items are covered in the Job Menu for conventional surveying, starting on Page R-35.

A: Settings

B: Edit Points

C: Edit Polylines

D: Edit Alignments

E: Auto Linework

F: View Raw Data File

G: View DTM

H: Manage Layers

I: Job Information

J: Calculator

Settings

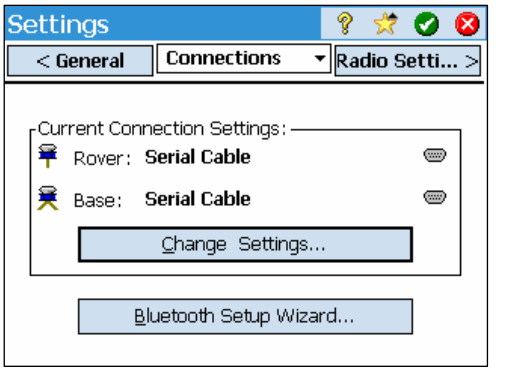
Job | Settings

The Settings screen provides access to several individual screens that control all hardware and software settings. The screens are provided in an index card format.

Connections

Job | Settings | Connections

The Connections card is used to configure how the data collector will communicate with the base and rover receivers.



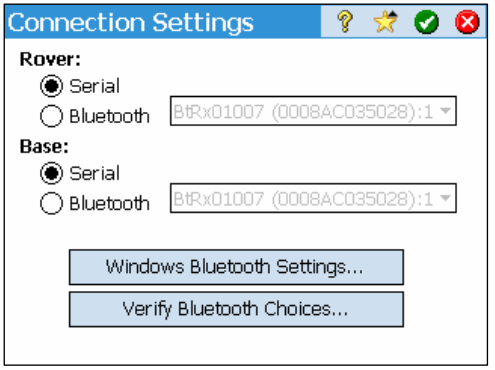
Current Connection Settings: Displays the current connection settings (Bluetooth or serial) for the base and rover receivers. Bluetooth connections are represented by a icon and a serial connection is shown with a green icon when the connection is active and a grey icon when the connection is inactive.

Change Settings...: Opens the Change Settings screen, described below.

Bluetooth Setup Wizard: Opens the Bluetooth Setup Wizard where you can detect and configure any Bluetooth EPOCH 25 receivers as described below.

Change Settings

Job | Settings | Connections | Change Settings



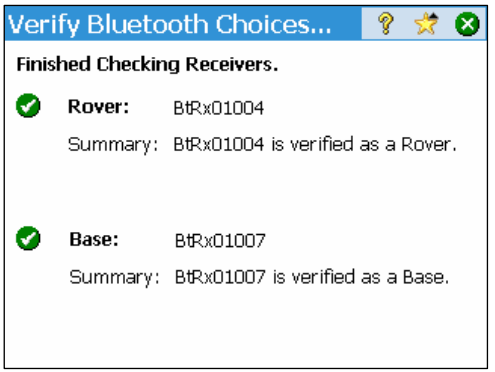
The Change Settings screen can be used to quickly switch the base/rover receiver between serial and Bluetooth and access other Bluetooth tools.

Windows Bluetooth Settings: Opens the Windows Bluetooth Settings screen where Bluetooth devices can be configured. You will typically only use this screen when configuring a Bluetooth cellular phone for Internet base corrections as described in the Radio Settings screen on Page 112.

Verify Bluetooth Choices: Opens the Verify Bluetooth Choices screen, described below.

Verify Bluetooth Choices

Job | Settings | Connections | Change Settings | Verify Bluetooth Choices


Verify Bluetooth Choices...
Finished Checking Receivers.
Rover: BtRx01004
Summary: BtRx01004 is verified as a Rover.
Base: BtRx01007
Summary: BtRx01007 is verified as a Base.

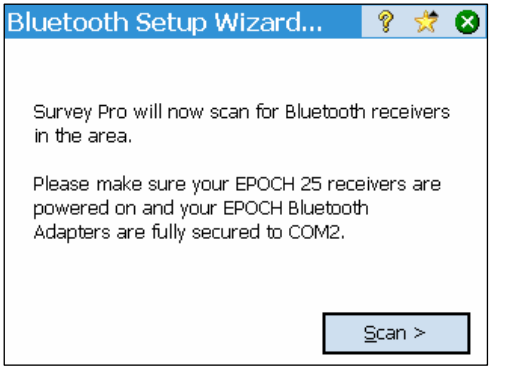
The Verify Bluetooth Choices screen performs a scan to quickly verify that the Bluetooth adaptors listed are connected to the corresponding receivers, or if a serial cable is connected. Be sure all receivers are powered on with the appropriate Bluetooth dongle(s) connected to Port 2 on the receiver(s) and any serial cables are attached before starting the scan.

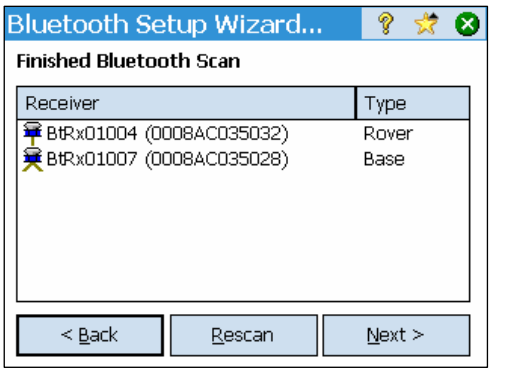
Bluetooth Setup Wizard

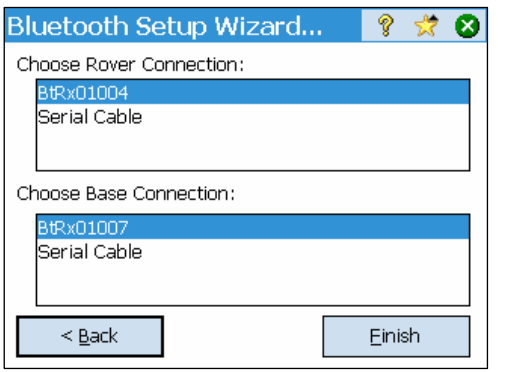
Job | Settings | Connections | Bluetooth Setup Wizard

The Bluetooth Setup Wizard uses a series of screens to walk you through the process of scanning for nearby Bluetooth receivers and configures their connections on the data collector. Any Bluetooth devices in the area that are not valid receivers will not be displayed. If a particular base/rover receiver is not detected, it is automatically configured to use a serial connection.

Note: This wizard will only detect EPOCH 25 Bluetooth receivers and specified Bluetooth dongles when used with supported data collectors with built-in Bluetooth running Windows Mobile 5. See the Radio Settings screen on Page 112 if configuring a Bluetooth cellular phone for use as a data modem for Internet base corrections.

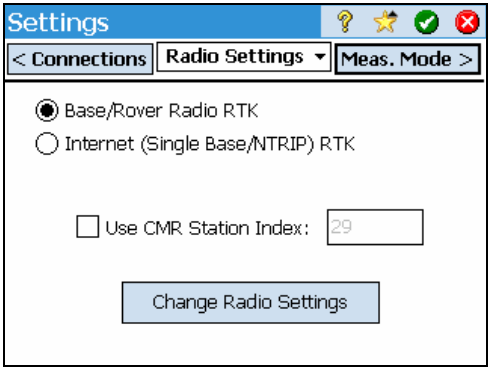

Bluetooth Setup Wizard...
Survey Pro will now scan for Bluetooth receivers in the area.
Please make sure your EPOCH 25 receivers are powered on and your EPOCH Bluetooth Adapters are fully secured to COM2.
Scan >

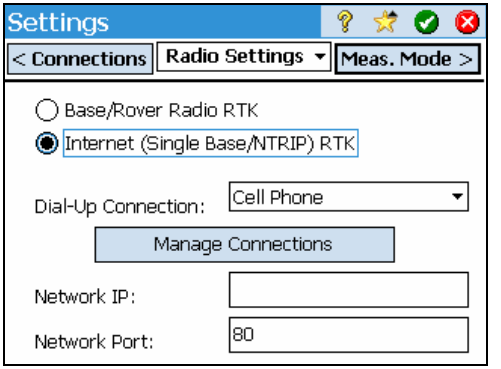




Radio Settings

Job | Settings | Radio Settings





The Radio Settings card is used to configure the base radio when using a local base/radio configuration, or configure a cellular phone as a data modem for Internet base corrections. The choice made from the upper radio buttons determines the remaining options on the screen.

Base/Rover Radio RTK: should be selected when using a local base receiver/radio configuration.

- **Use CMR Station Index**: should be checked in situations where more than one base is in range of the rover, allowing it to distinguish one from the other. Enter a unique value from 0-31 in the corresponding field.
- **Change Radio Settings**: opens the Change Radio Settings screen, described below.

Internet (Single Base/NTRIP) RTK: should be selected when using a cellular phone as a data modem for connecting to the Internet to receive Single Base/NTIP corrections.

- **Dial-Up Connection**: is where you select any existing dial-up connections that have been added from the Manage Connections routine.
- Manage Connections: is a shortcut to the Windows' Start > Settings > Connections > Connections screen where you can add/manage modem (cell phone) connections. Tapping the ? button from that screen will open the help for it. For more

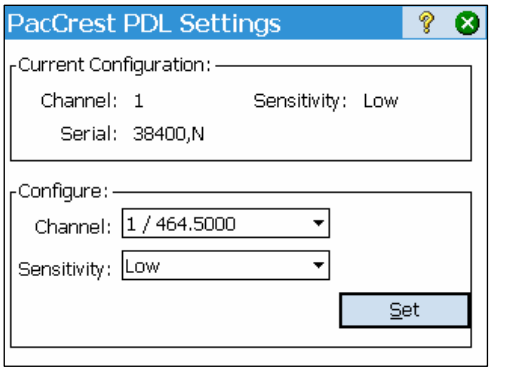
information on adding a modem connection, see *Using a Cellular Phone* in the *Basic GPS Module* section of the User's manual.

- **IP Address of Base**: is the IP address of the base, as provided by the Internet service.
- **Port (Socket) of Base**: is the socket number of the base, as provided by the Internet service.

Change Radio Settings Screen

Job | Settings | Radio Settings | Change Radio Settings

The Change Radio Settings screen is used to view the current base radio settings and change the channel/sensitivity.



Channel: displays the last radio channel when applicable.

Sensitivity: displays the last radio sensitivity when applicable.

Baud: displays the baud rate the receiver will use to communicate with the modem.

Parity: displays the parity the receiver will use to communicate with the modem.

Configure: is where you can configure the channel the radio will use to communicate with the other radio and the sensitivity of the radio.

Set: sends commands to the radio firmware to configure the settings selected on this screen.

Note: some settings on the radio cannot be modified with Survey Pro. To fully program the radio modems, you need to PC software that should be supplied with the radio.

Measure Mode

Job | Settings | Meas. Mode

See Page R-106.

Post Process

Job | Settings | Post Process

See Page R-107.

Units

Job | Settings | Units

See Page R-41.

Format

Job | Settings | Format

See Page R-43.

Files

Job | Settings | Files

See Page R-44.

Surveying

Job | Settings | Surveying

See Page R-45.

Stakeout

Job | Settings | Stakeout

See Page R-47.

Date/Time

Job | Settings | Date/Time

See Page R-54.

Buttons

Job | Settings | Buttons

See Page R-55.

General

Job | Settings | General

See Page R-56.

Survey Menu

The Survey Menu contains the routines used for collecting data. See Page R-171 for a description of the Survey Menu if running in GPS mode.

A: Backsight Setup

B: Traverse / Sideshot

C: Repetition Shots

D: Multiple Sideshots

E: Distance Offset

F: Horizontal Angle Offset

G: Vertical Angle Offset

H: Auto Collect

I: Corner & 2 Lines

J: Corner & Angle

K: Corner & Offset

L: Corner & Plane

M: Surface Scan

N: Video Scan

O: Shoot From Two Ends

P: Record Mode

Q: Resection

R: Remote Elevation

S: Check Point

T: Solar Observation

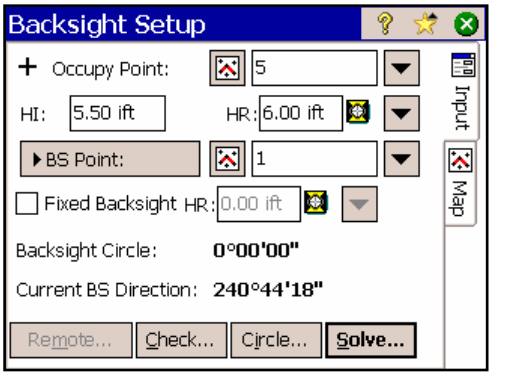
U: Remote Control

Backsight Setup

Survey | Backsight Setup

The Backsight Setup screen allows you to define your backsight prior to performing data collection or stakeout. The screen is also accessible from any screen that requires a backsight.

Note: all the information in the Backsight Setup screen is saved and will automatically be recalled if the job is reopened at a later time, but the screen must still be re-solved before you can begin surveying.



Occupy Point: is the name of the point from the current job that the total station is occupying.

HI: is the height that the total station is above the ground.

HR: is the distance that the backsight prism is above the ground.

▼: opens the Smart Target options (Page R-449).

▸ BS Point / ▸ BS Direction: is the point or direction of the backsight where the total station is facing.

Fixed HR at Backsight: is selected when a second prism is set up over the backsight. The rod height entered here is then used independently of the other rod height when checking the backsight by distance and when shooting the backsight during repetition shots.

Backsight Circle: displays the backsight circle value, which is set using the Backsight Circle button, described below.

Note: The backsight circle angle is subtracted from all horizontal angles that are read during data collection and the resulting points are adjusted accordingly. This is usually only done when surveying in true azimuths. This value can be change from the Backsight Circle or Backsight Solved screens.

Current BS Direction: displays the azimuth of the current backsight.

Check... : opens the Check Backsight dialog box (Page R-122), which is used to help confirm that the total station is facing the correct backsight. This routine can also be performed from the Backsight Solved screen.

Circle... : opens the Backsight Circle dialog box (Page R-123) where the backsight circle can be changed, or the circle reading on the total station can be set remotely without re-solving the backsight. (This function will automatically be available after solving the first Backsight Setup screen.)

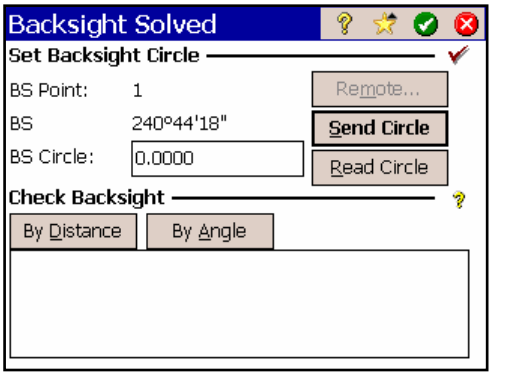
Solve... : solves the screen based on the information entered and opens the Backsight Solved screen, described next.

Backsight Solved

Survey | Backsight Setup | Solve...

The Backsight Solved screen is automatically opened after solving the Backsight Setup screen. It is used to send or read the instrument's circle, optionally confirm the backsight location, and optionally store a new point for the backsight location.

Note: The Backsight Solved screen will not open when the Use Classic Backsight Setup checkbox is checked in the Survey Settings screen (Page R-45).



Set Backsight Circle: Once the circle value of the instrument has been set or read, the ? symbol will be replaced with a ✔.

Store Backsight Point: This button is only available when the backsight is defined by a direction instead of a point and is used if you want to take a shot and store a point for the current backsight. Once stored, the button will be replaced by the new point name.

BS Circle: This is the horizontal angle to set in the instrument. This will usually be zero, but when Survey with True Azimuths is enabled in the Surveying Settings screen (Page R-45), this will be the computed azimuth to the current backsight.

Remote...: when connected to a robotic total station, this opens the Remote Control screen (Page R-162) to remotely aim the total station. This is particularly useful when using a fixed backsight with a Smart Target because the Remote Control screen will then automatically reflect the prism configuration at the backsight.

Send Circle: This will send the circle entered in the BS Circle field to the instrument.

Read Circle: Will read the current horizontal angle from the instrument and set that as the backsight circle. (Non-zero backsight circle values are typically used only when surveying in true azimuths.)

Check Backsight: Once the backsight has been checked by distance or angle, the ? symbol will be replaced with a ✓.

By Distance: will take a shot to a prism located over the backsight point and compare the measured distance with the computed distance between the occupy and backsight points stored in the current job.

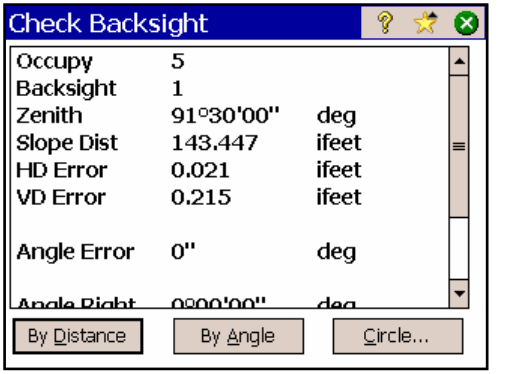
Note: Checking the backsight by shooting a distance does not apply if the backsight is defined by a direction.

By Angle: when the backsight is defined by a direction, this routine will read the current horizontal angle from the total station and compare that to the backsight direction.

Check Backsight

Survey | Backsight Setup | Check...

The Check Backsight screen is used to help confirm that the total station is facing the correct backsight by comparing the known distance or circular angle to the backsight with the measured value.



By Distance: will take a shot to a prism located over the backsight point and compare the measured distance with the computed distance between the occupy and backsight points stored in the current job.

Note: The Check by Distance method does not apply if the backsight is defined by a direction.

By Angle: when the backsight is defined by a direction, this routine will read the current horizontal angle from the total station and compare that to the backsight direction.

Circle...: opens the Backsight Circle dialog box, described below.

Check by Distance Results

Occupy: is the current occupy point.

Backsight: is the current backsight point.

Zenith: is the zenith angle measured by the total station.

Slope Dist: is the slope distance measured by the total station.

HD Error: is the horizontal distance between the backsight point that was shot and the backsight point stored in the job. A negative value indicates that the point shot is closer to the total station than the point in the job.

VD Error: is the vertical distance between the backsight point that was shot and the backsight point stored in the job.

Check by Angle Results

Circle: is the horizontal angle that was measured by the total station.

Azimuth: is the known azimuth to the current backsight.

Error: is the difference between the two above angles.

Backsight Circle

Survey | Backsight Setup | Circle...

The Backsight Circle dialog box is used to modify the horizontal angle read from a total station so that the resulting angle is an azimuth. This routine can also be performed from the Backsight Solved screen.

Backsight Circle: is the angle that will be subtracted from all horizontal angles read from the total station or entered manually when data collecting in manual mode.

Set: Sets the value entered in the Backsight Circle field as the backsight circle and returns to the previous screen.

Note: Closing this dialog box without tapping the Set button will result in no changes made to the original backsight circle.

Read from Instrument: Reads the current horizontal angle from the total station and puts that value in the Backsight Circle field where it can then be Set as the backsight circle. This is typically performed when it is known that the total station is facing a direction with a zero azimuth.

Traverse / Sideshot

Survey | Traverse / Sideshot

The Traverse / Sideshot screen is the main screen used for data collection.

: is a shortcut to the Surveying Settings screen (Page R-45).

Foresight: is the point name that will be used for the next stored point.

Description: is the description for the next stored point.

HR: is the height of the rod.

: opens the Smart Target options (Page R-449).

Side Shot: will trigger the total station to take a shot to the prism. The new point is stored as a side shot in the data collector and the foresight point will automatically advance to the next available point.

Traverse: will trigger the total station to take a shot to the prism. The new point is stored as a traverse shot in the data collector and a The Traverse Now or Later dialog box will open, described on Page R-126. If you choose to traverse now, the occupy point will automatically change to the previous foresight point and the backsight point will automatically change to the previous occupy point.

Note: prior to storing a point, you may then be prompted for description, rod height, layer, and/or feature information depending on the selections made in the Surveying Settings screen.

Backsight...: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Note: The current backsight information is displayed across the top of the Traverse / Sideshot screen.

Results

Angle Right: is the horizontal angle right around the Occupy Point from the Backsight to the Foresight Point.

Azimuth: is the azimuth from the Occupy Point to the Foresight Point.

Zenith: is the zenith angle measured by the total station to the prism.

Slope Dist: is the slope distance measured by the total station to the prism.

Horz Dist: is the horizontal distance from the Occupy Point to the Foresight Point.

Vert Dist: is the vertical distance from the Occupy Point to the Foresight Point.

Point: is the name of the stored point.

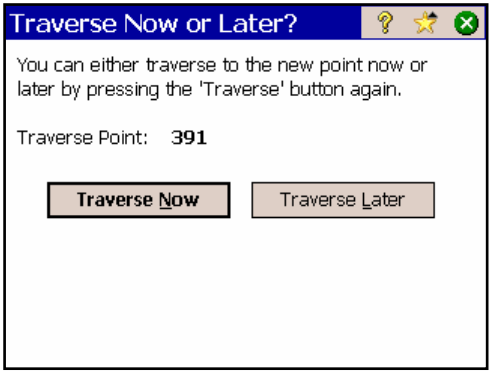
Desc: is the description of the stored point.

Location N: is the Y-coordinate of the stored point.

Location E: is the X-coordinate of the stored point.

Location Z: is the elevation of the stored point.

Traverse Now or Later?


Traverse Now or Later?
You can either traverse to the new point now or later by pressing the 'Traverse' button again.
Traverse Point: 391
Traverse Now
Traverse Later

After taking a shot with the Traverse button, the Traverse Now or Later? dialog box will open where you can specify if you want to traverse now or later .

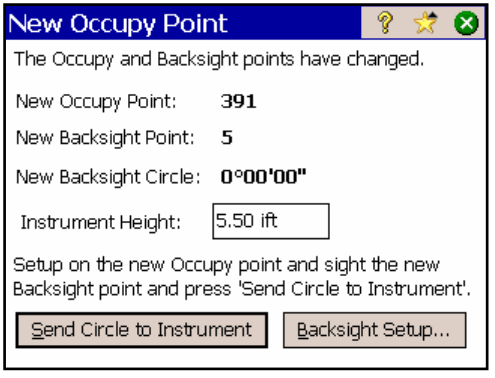
Traverse Now: expects you to move your total station to the next occupy point before any additional shots are taken. The occupy, foresight, and backsight points will be updated accordingly.

Traverse Later: allows you to take additional side shots before moving the total station to the next traverse point. This is useful is you want to take side shots from the current occupy point, but perform the traverse shot as the first shot of the current set up to ensure the highest accuracy.

When you have finished taking side shots, tap the Traverse button again. You can then select Traverse Now and set up on the next occupy point, or select Shoot New Traverse to re-shoot the traverse shot.

New Occupy Point

After traversing to a new point, the New Occupy Point dialog box will open that informs you of the points that have been updated and computes the azimuth to the new backsight.


New Occupy Point
The Occupy and Backsight points have changed.
New Occupy Point: 391
New Backsight Point: 5
New Backsight Circle: 0°00'00"
Instrument Height: 5.50 ift
Setup on the new Occupy point and sight the new Backsight point and press 'Send Circle to Instrument'.
Send Circle to Instrument
Backsight Setup...

New Backsight Circle: displays the horizontal angle that should be displayed on the total station once it is set up over the New Occupy Point and facing the New Backsight Point. This angle is typically zero unless you are surveying in true azimuths, as set in the Surveying Settings screen (Page R-45).

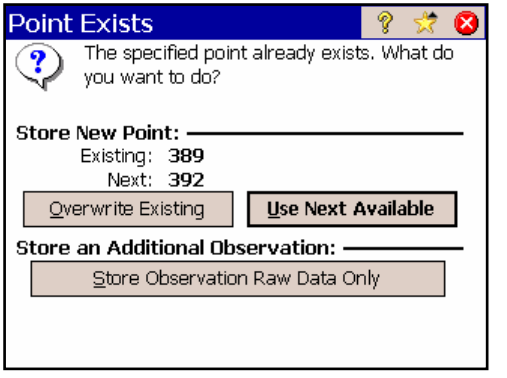
Height of Instrument: is the new height that the total station is above the ground.

Send Circle to Instrument: can be used once the instrument has been moved to the New Occupy Point and is aiming toward the New Backsight Point. The New Backsight Circle angle will then be sent to the total station so its horizontal angle will display this value.

Backsight Setup: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Point Exists

Survey | Traverse / Sideshot | Traverse or Side Shot



When performing a traverse or side shot and the foresight point name already exists, the Point Exists screen will open where you select how to handle the new point.

Overwrite Existing: will overwrite the existing point with the new coordinates.

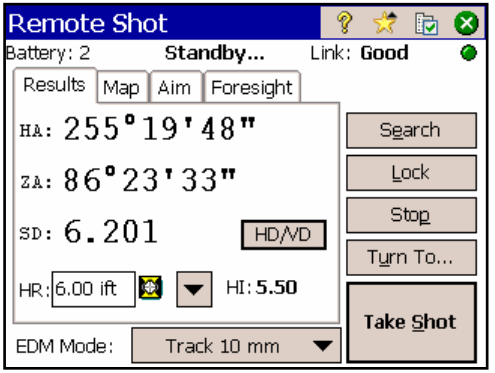
Use Next Available: will store the coordinates using the next available point name.

Store Additional Observation: will write an observation record to the raw data file with the new coordinate values without changing the existing point in the job file. (This button is not available when shooting an existing traverse shot.)

Remote Shot (Remote Mode)

Survey | Traverse / Sideshot | Traverse or Side Shot

When running in remote mode, tapping the Traverse or Side Shot button from the Traverse / Sideshot screen will open the Remote Shot screen, shown here.



The Remote Shot screen is identical to the Remote Control screen (Page R-162), except it has an additional button that allows you to trigger the total station to take a shot.

Take Shot: After the total station is properly aiming toward the prism, this will trigger the total station to take a shot. If you are performing a side shot, you will remain in the Remote Shot screen once the shot is completed. If you are performing a traverse shot, you will return to the Traverse / Sideshot screen when the shot is completed.

Aim: Opens the Aim screen described on Page R-168.

Foresight: Displays the computed coordinates for the current foresight.

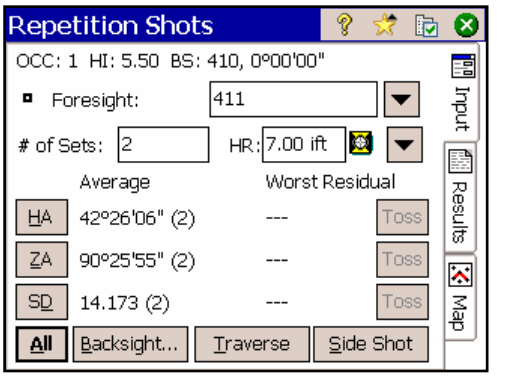
Repetition Shots

Survey | Repetition Shots

The Repetition Shots screen is used to perform side shots or traverse shots using any number of repetitions.

Note: The sequence that the repetition shots are performed is selected in the Repetition Settings screen (Page R-53).

: is a shortcut to the Surveying and Repetition Settings screens (Page R-45 and R-53 respectively).



Foresight: is the name of the point that will be stored.

Number of Sets: is the desired number of sets to shoot to the backsight and foresight.

Note: One set is equivalent to two shots to the backsight and foresight point.

HR: is the rod height.

: opens the Smart Target options (Page R-449).

Average (of): shows the average angle or distance to the foresight from all the shots taken. The value in parenthesis is the total number of repetitions performed.

Worst Residual: displays the worst residual calculated from all the sets of the selected measurement type.

Description: is the description for the point that is being stored. This field appears prior to storing the new point.

Note: A residual is the difference between a single measurement and the average of all the measurements.

Note: If a residual exceeds the tolerances set in the Repetition Settings screen (Page R-53), that value is displayed in **bold** text.

HA, ZA, SD: allows you to replace the current repetition data for the corresponding button with new data. Once tapped, the repetition data for the tapped button will be deleted. You will then need to perform all sets defined in the Number of Sets field again, where the new data will replace the corresponding deleted data.

All: will open a screen that asks if you want to add an additional set to those already done or start over.

Toss: will delete the corresponding set that has the worst residual.

Note: A set can only be "tossed" when three or more sets have been collected.

Side Shot: will use the repetition data gathered to create a new side shot point. The foresight point will automatically advance to the next available point.

Traverse: will use the repetition data gathered to create a new traverse point. The occupy point will automatically update to the previous foresight point and the backsight point will automatically update to the previous occupy point.

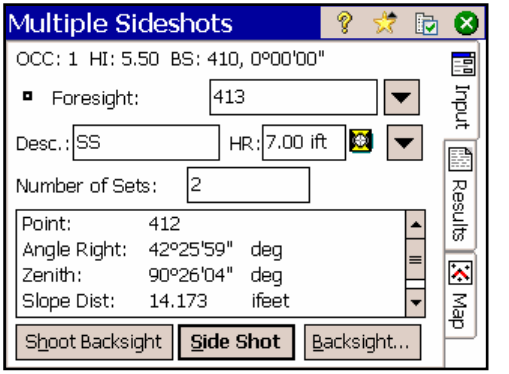
Backsight...: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Note: The current backsight information is displayed across the top of the Repetition Shots screen.

Multiple Sideshots

Survey | Multiple Sideshots

The Multiple Sideshots screen is used to perform multiple side shots using any number of repetitions to each foresight without the need to re-shoot the backsight.



Foresight: is the point name that will be stored.

Description: is the description for the next stored point.

HR: is the length of the rod.

▼: opens the Smart Target options (Page R-449).

Number of Sets: is the desired number of sets to shoot to the backsight or foresight.

: is a shortcut to the Surveying and Repetition Settings screens (Page R-45 and R-53 respectively).

Shoot Backsight: is used to shoot the backsight. You will be required to shoot the number of sets to the backsight entered in the Number of Sets field.

Note: The backsight can be re-shot at any time, but it must be shot before the first side shot can be shot.

Side Shot: is used to shoot a side shot. Once the final set is complete, the new point is stored and the foresight point will automatically advance to the next available point.

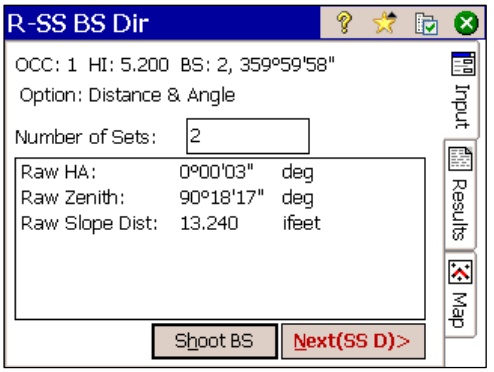
Backsight...: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Radial Sideshots

Survey | Radial Sideshots

The Radial Sideshots routine combines the functionality of the Multiple Sideshots routine with the accuracy of the Repetition Shots routine. It is used to perform repetition shots to a backsight and any number of foresights (side shots) from the same occupy point.

The routine consists of multiple screens. Each is customized according to where you are in the routine. Consult the User's manual for more information on using this routine.



: accesses the Surveying Settings screen (Page R-45) and Radial Sideshot Settings screen, which is identical to the Repetition Settings screen (Page R-53) with the exception of the choices for the Shooting Sequence. Select B>F1>..>Fn^F1>..>Fn>B to shoot all Face 2 side shots in the same order as the Face 1 side shots, or B>F1>..>Fn^Fn>..>F1>B to shoot the Face 2 side shots in reverse order.

Option: When shooting the first set, measuring a distance and angle for each shot is required, but when starting all subsequent sets, Angle Only can also be selected for this field.

Number of Sets: is where the desired number of sets is specified.

Done with SS > : is used when you are finished shooting side shots. This is only available while taking Face 1 side shots for the first set.

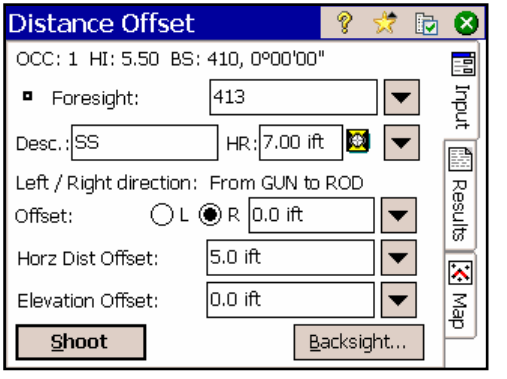
Shoot / Shoot BS : is used to shoot the current point. If the shot was already performed, the Next > button will be enabled. Tapping Shoot again will throw out the results of the last shot and re-shoot it.

Next > : is used to take the next required shot in the routine. The button label will contain additional information to help indicate which shot is required next.

Distance Offset Shot

Survey | Distance Offset

The Distance Offset screen is used to store a new point that is a known distance away from the rod location. This screen is useful when the rod cannot occupy the new point's location.



: is a shortcut to the Surveying Settings screens (Page R-45).

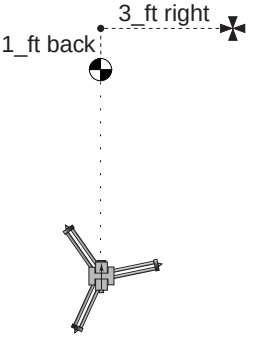
Foresight: is the point name that will be stored.

Description: is the description for the offset shot that is stored.

HR: is the length of the rod.

: opens the Smart Target options (Page R-449).

Offset: is the offset distance that is to the left (when L is selected) or right (when R is selected) of the prism from the total station's point of view.



Horz Dist Offset: is the offset distance that is beyond the prism (positive value) or in front of the prism (negative value) from the total station's point of view.

Elevation Offset: is the offset distance that is below the prism (negative value) or above the prism (positive value).

Note: multiple offsets can be applied simultaneously.

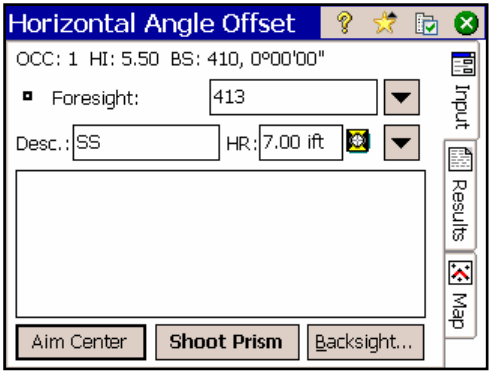
Shoot: will take a shot to the prism, apply the offset(s) entered, and then store the new point.

Backsight...: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Horizontal Angle Offset

Survey | Horizontal Angle Offset

The Horizontal Angle Offset screen allows you to compute and store the location of a new point that cannot be occupied, such as at the center of large tree.

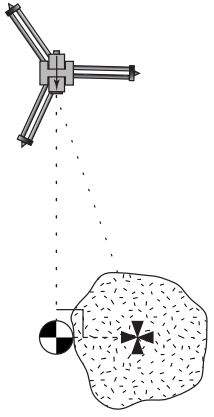


The routine shoots a prism positioned at the side of the new point and then reads the horizontal angle when aiming toward the center of the new point to compute the new point's location.

: is a shortcut to the Surveying Settings screen (Page R-45).

Foresight: is the point name that will be used when storing the new point.

Aim Center: will record the horizontal angle from the total station, which should be facing the center of the new point.



Shoot Prism: will take a shot to the prism, which is located at the side of the new point.

Backsight...: opens the Backsight Setup screen (Page R-118).

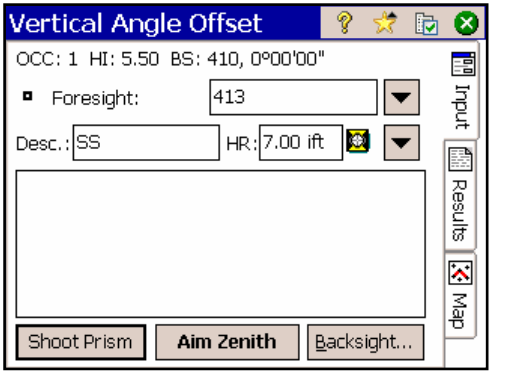
Note: The new point will have the same elevation as the point occupied by the prism.

Note: The prism only needs to occupy the location at the side of the new point. A prism is not necessary when shooting the location directly in front of the new point.

Vertical Angle Offset

Survey | Vertical Angle Offset

The Vertical Angle Offset screen allows you to compute and store the location of a new point that exists directly above or below the rod location, but cannot be occupied, such as the top of a utility pole.



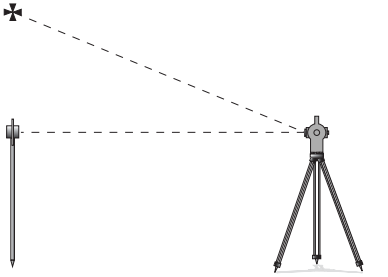
The new point will have the same coordinates as the rod location, but with a different elevation.

: is a shortcut to the Surveying Settings screen (Page R-45).

Foresight: is the point name that will be used when storing the new point.

Shoot Prism: will take a shot to the prism.

Aim Zenith: will read the vertical angle measured by the total station, which should be facing the new point's location.



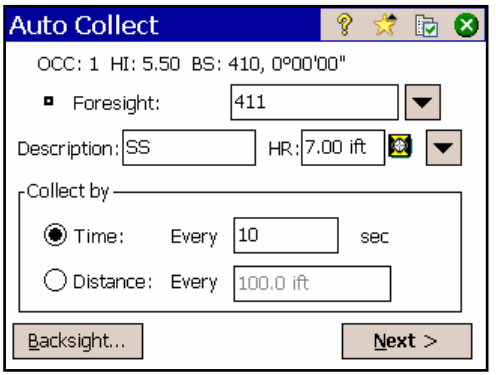
Backsight...: opens the Backsight Setup screen (Page R-118).

Auto Collect

Survey | Auto Collect

The Auto Collect screen allows users with robotic total stations to automatically collect points either at a specified time interval or after the rod has moved a specified horizontal distance.

Note: This routine only works when used with a robotic total station in remote control mode.



: is a shortcut to the Surveying Settings screen (Page R-45).

Foresight: is the point name that will be used when storing the first new point. Each successive point name will automatically be incremented by the next available point number.

Description: is the description that will be assigned to all the points that are stored from this routine.

Time: when this radio button is selected, a point will automatically be stored after each time specified in the corresponding field passes.

Distance: when this radio button is selected, a point will automatically be stored each time the prism is moved from the last stored point by the horizontal distance specified in the corresponding field.

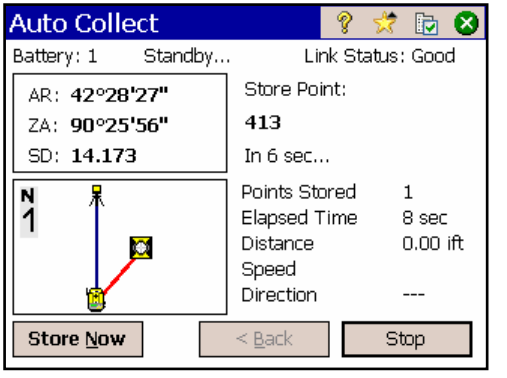
Note: The accuracy that a point will be stored when auto collecting by Distance will vary depending on how frequently the total station measures a distance and how fast the prism is traveling.

Backsight... : opens the Backsight Setup screen (Page R-118).

Next > : opens the next screen.

Auto Collect – Screen Two

The second Auto Collect screen displays information related to the points that have been stored and when the next point will be stored.



The box in the upper-left corner displays the direction and distance the total station is aiming relative to the backsight.

The upper-right corner displays the next store point number and when the next point will be stored in either seconds or distance.

The lower-left corner is a graphic that shows the current total station position, the current prism position, and when collecting by distance, the approximate location of the next store point (represented by an X) based on the speed and direction the prism is moving from the previous store point. Previous stored points are also displayed as dots in this part of the screen.

The lower-right corner of the screen displays the number of points that have been stored and the speed and direction the prism is traveling.

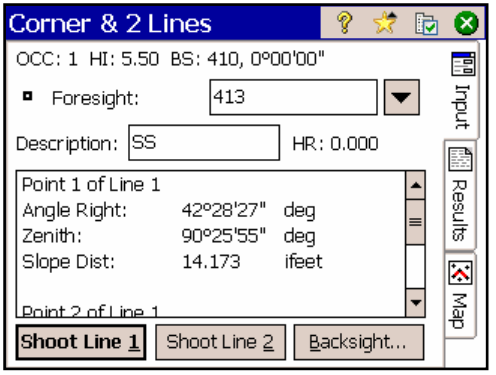
Store Now : stores a point at the current prism location, even if the time / distance criteria is not yet met.

< Back : returns to the previous Auto Collect screen.

Start / Stop : toggles between starting or stopping the Auto Collect routine.

Corner & 2 Lines

Survey | Corner & 2 Lines

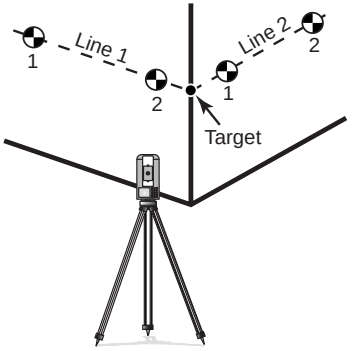


The Corner and 2 Lines screen is used to store a point at the corner of a structure using a reflectorless total station where a direct measurement to the point is not possible, but two points on two intersecting lines can be shot.

Foresight: is the name of the point that will be stored.

Description: is the description for the point that will be stored.

HR: 0.000: shows that no rod height will be used with this routine since all shots are direct reflectorless.



Corner & 2 Lines

Shoot Line 1: will prompt you to take two shots on Line 1, which intersects with Line 2 at the point you want to store.

Note: Each shot for a line can be in any location on the same line. (Shot 1 can be to the left or the right of Shot 2.)

Shoot Line 2: will prompt you to take two shots on Line 2, which intersects with Line 1 at the point you want to store.

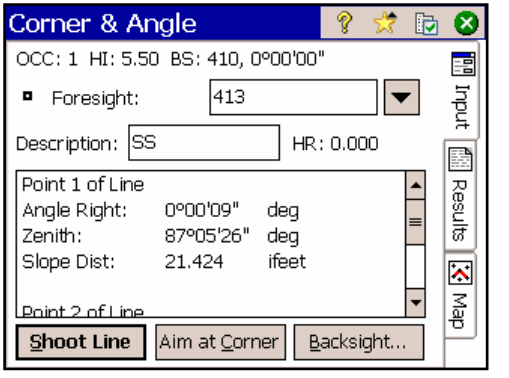
Note: After all shots are done, the computed elevation is displayed for the new point. You can either enter a different elevation or tap ✔ to accept the computed elevation.

Backsight: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Corner & Angle

Survey | Corner & Angle

The Corner and Angle screen is used to store a point that cannot be shot on a reference line using a reflectorless total station where two other points on the same line can be shot.



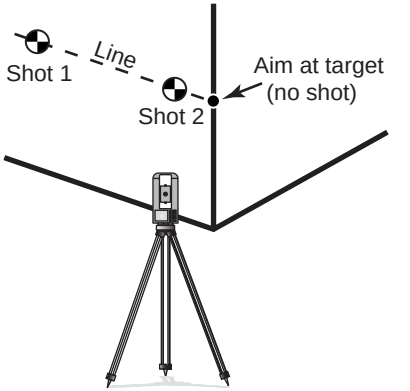
Foresight: is the name of the point that will be stored.

Description: is the description for the point that will be stored.

HR: 0.000: shows that no rod height will be used with this routine since all shots are direct reflectorless.

Shoot Line: will prompt you to take two shots on a line that intersects with the point you want to store.

Note: Each shot can be in any location on the line. (Shot 1 can be to the left or right of Shot 2.)



Corner & Angle

Aim at Corner: will prompt you to aim at the corner (the point that you want to store). Although no shot is taken, the angles to the point will be used to compute its location.

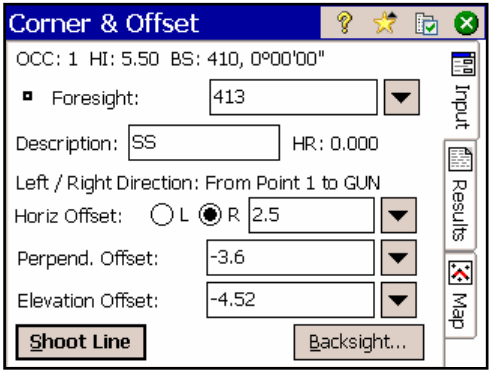
Note: After all shots are done, the computed elevation is displayed for the new point. You can either enter a different elevation or tap ✔ to accept the computed elevation.

Backsight: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Corner & Offset

Survey | Corner & Offset

The Corner and Offset screen is used to store a point using a reflectorless total station for a point that cannot be shot directly, but the offset(s) to the point can be measured from a reference line that can be shot.

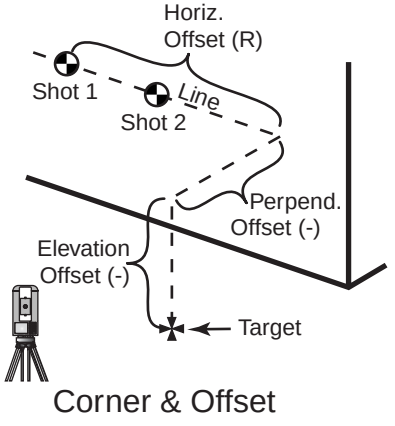


Foresight: is the name of the point that will be stored.

Description: is the description for the point that will be stored.

HR: 0.000: shows that no rod height will be used with this routine since all shots are direct reflectorless.

Horiz Offset: is the horizontal distance on the line from Shot 1 to the new point. Select ◉ L if the new point falls to the left of Shot 1, or select ◉ R if it falls to the right.



Perpendicular Offset: is the horizontal distance, perpendicular to the reference line, from the line to the new point (see diagram). A positive value extends away from the total station where a negative value is closer to the total station.

Elevation Offset: is the vertical offset from the line to the new point. (See diagram.) A positive value will result in a new point above the reference line and a negative value results in a new point below the reference line.

Shoot Line: will prompt you to take two shots on the horizontal reference line.

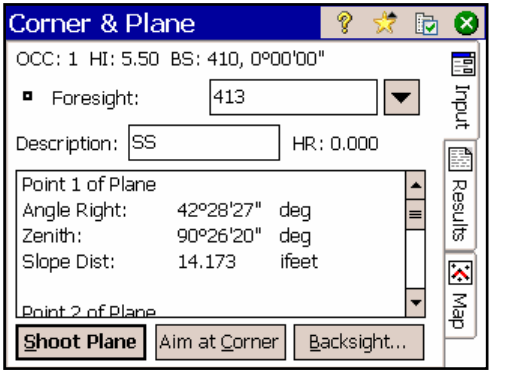
Note: Each shot can be in any location on the reference line (Shot 1 can be to the left or the right of Shot 2), but the Horiz Offset is always measured from Shot 1.

Backsight: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Note: After each shot is complete, the computed elevation is displayed for the new point. You can either enter a different elevation or tap ✔ to accept the computed elevation.

Corner & Plane

Survey Corner & Plane



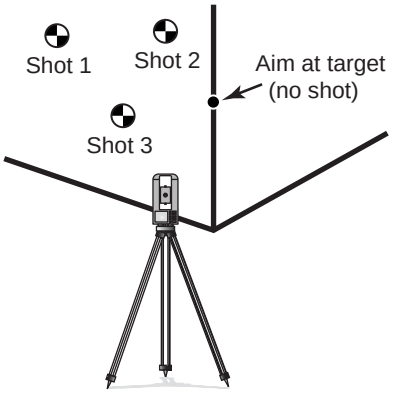
The Corner and Plane screen is used to store a point using a reflectorless total station for a point that cannot be shot, but three points on the same plane can be shot.

Foresight: is the name of the point that will be stored.

Description: is the description for the point that will be stored.

HR: 0.000: shows that no rod height will be used with this routine since all shots are direct reflectorless.

Shoot Plane: will prompt you to take three shots on the same flat surface that the new point is located.



Corner & Plane

Note: Each shot can be in any location on the same plane, but they must not form a straight line and they should not be grouped close together.

Aim at Corner: will prompt you to aim at the corner (the point that you want to store). Although no shot is taken, the angles to the point will be used to compute its location.

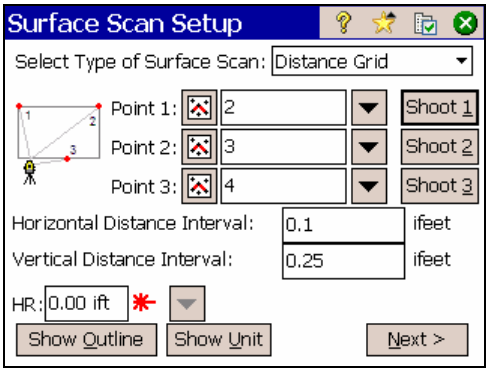
Note: After all shots are done, the computed elevation is displayed for the new point. You can either enter a different elevation or tap ✔ to accept the computed elevation.

Backsight: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

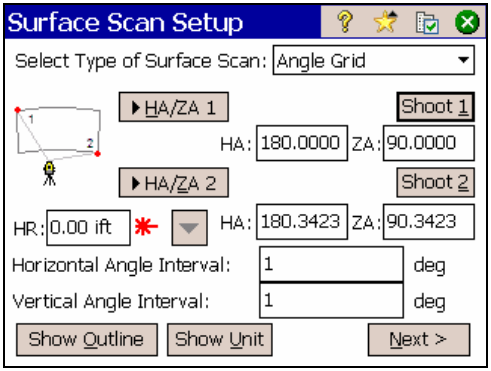
Surface Scan

Survey | Surface Scan

The Surface Scan screen takes advantage of a robotic, reflectorless total station to automatically take a sequence of shots of a surface. PC software can then use the data to generate a 3-D raster image of the surface or a DTM surface to compute volume information. Consult the User's Manual for more information on performing a surface scan.



Distance Grid Surface Scan



Angle Grid Surface Scan

Select Type of Surface Scan: Select the type of surface scan to perform here. The option selected will determine how you will define your perimeter and distance intervals.

Distance Grid

Point 1, **Point 2**, **Point 3**: Are the point names that will be used when storing the upper-left, upper-right and lower points that define the surface perimeter.

Note: If any points defining your perimeter already exist, the point names can be entered in these fields without re-shooting them.

Shoot 1, Shoot 2, Shoot 3: Shoots and stores the corresponding point.

Horizontal Distance Interval: is the horizontal distance between each shot taken during the surface scan.

Vertical Distance Interval: is the vertical distance between each shot taken during the surface scan.

Angle Grid

▸ HA/ZA / ▸ Point: Allows you to define the corners of your perimeter by taking a shot to measure the horizontal and zenith angles to each corner (or enter them in by hand), or by selecting existing points from the current job, respectively.

Horizontal Angle Interval: is the horizontal angle that will be turned between each shot taken during the surface scan.

Vertical Angle Interval: is the vertical angle that will be turned between each shot taken during the surface scan.

HR: is the rod height, which should typically be set to zero since all shots taken are reflectorless (no rod).

Show Outline: This will cause the total station to scan the perimeter of the defined surface. This is useful to visually check the perimeter of your surface when the laser pointer is activated on the total station.

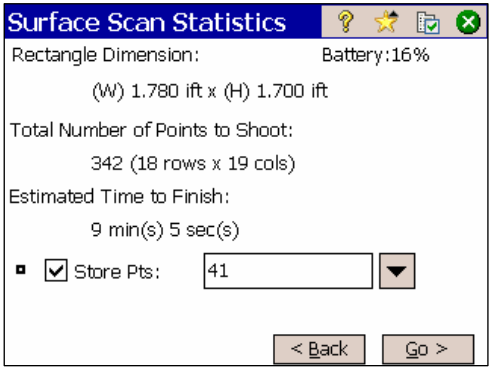
Show Unit: This will cause the total station to scan a single horizontal/vertical interval. This is useful to visually check your interval settings when the laser pointer is activated on the total station.

Next >: Opens Surface Scan Statistics screen.

Surface Scan Statistics

Survey | Surface Scan | Next >

The Surface Scan Statistics screen displays details about the surface that was just defined.



Store Pts: This box should be checked to store the points that are shot during the surface scan. Enter the starting point number in the corresponding field.

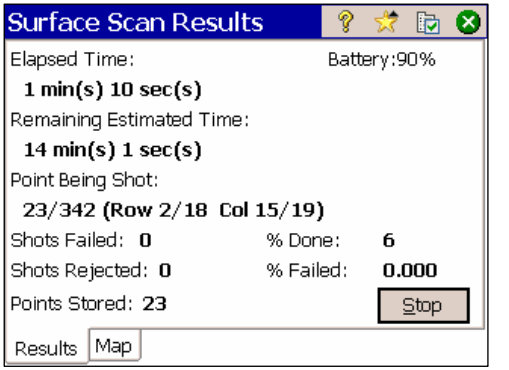
Back: Returns to the previous screen.

Go >: Opens the Surface Scan Results screen

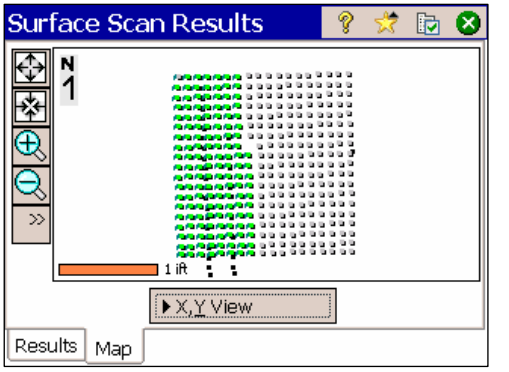
Surface Scan Results

Survey | Surface Scan | Next > | Go >

The Surface Scan Results screen contains two cards that detail the progress of the surface scan. The Map card shows the points that were shot in green, points that have not yet been shot in gray and rejected points in red.



Stop (Results card): will stop the surface scan.



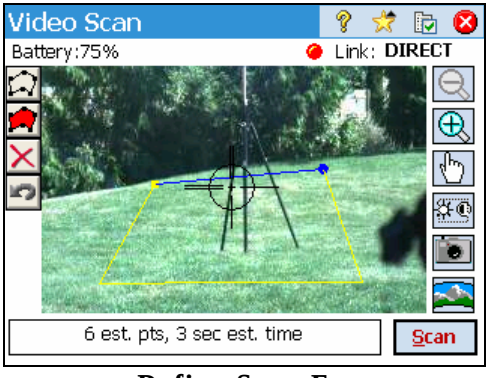
X,Y View / X,Z View (Map card): Changes the orientation of the current view.

Video Scan

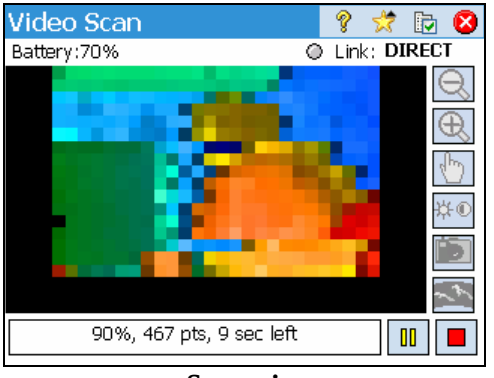
Survey | Video Scan

This feature is only available when using a supported total station with a USB or supported radio connection, and only on data collectors running Windows Mobile 5.

The Video Scan routine will quickly take several measurements within a predefined area (scan frame). The data is stored to a *.tsf *Point Cloud* file, which, along with the raw data file, can be read by Trimble RealWorks software to digitally model the surface. Full 360° 3D surfaces can be modeled with RealWorks for areas that are scanned from three different occupy points around the area. RealWorks is also able to integrate any photos taken of the area with the scanned data.

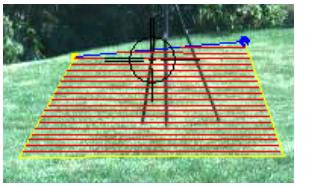


Define Scan Frame



Scanning

Polygon Framing / **Rectangular Framing**: This button toggles between two sets of buttons displayed on the left side of the screen. When is displayed, a scan frame is defined by tapping three or more points on the screen in sequence around the scan frame to create a polygon with three or more sides. When is displayed, a rectangular scan frame is defined by tapping two diagonal corners.



Hatching Tool: fills an existing scan frame with parallel lines to make it stand out visually.

Clear Scan Frame Data: clears any scan frame data from the screen.

/ **Scan Frame Toggle**: inverts the horizontal limits of an existing rectangular scan frame. This tool can be used to quickly define a 360° scan frame for taking panoramic photos by first creating a rectangular scan frame with the desired height and a near-zero width and then tap this button.

Predefined Vertical Scan Frame: generates a vertical scan frame with horizontal limits that fall within the video image and vertical limits that extend to the vertical turning limits of the total station.

Note: Once a scan frame is defined, it can be resized by dragging the edges or corners.

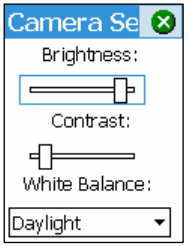
Predefined Horizontal Scan Frame: generates a horizontal scan frame with vertical limits that fall within the video image and with horizontal limits that wrap nearly 360° around the total station.

Undo: will undo the last change(s) made to the current scan frame with each tap.

Zoom In: will digitally zoom in the image with each tap between four levels from 1x to 4x.

Zoom Out: will zoom out with each tap from 4x back to 1x.

Define Scan Frame / **Aim Instrument**: toggles between two modes. When in Aim Instrument mode, tapping anywhere within the video image will turn the total station to that location. When in Define Scan Frame mode, you can create a scan frame by tapping on the screen.



Brightness/Contrast: opens a dialog box where the brightness, contrast and white balance can be adjusted.

Take Photo: Takes a digital photo and stores the photo to a file. (See Video Settings on Page 167 for details on configuring the settings for this feature.)

Take Panoramic Photo: This will take a photograph within the current polygonal or rectangular scan frame. When a large scan frame is defined, multiple photos of the entire area are taken with minimal overlap. The photos can later be automatically stitched together and viewed, or used for texture maps in RealWorks. The individual images are stored in the current job folder with a unique series name.

Scan: opens the second Video Scan screen and starts the scanning process. Colored blocks will appear on the screen for each new point scanned. The color will vary depending on the distances measured and the reflectivity of each point.

Pause: pauses the scanning process. Tapping again will continue scanning.

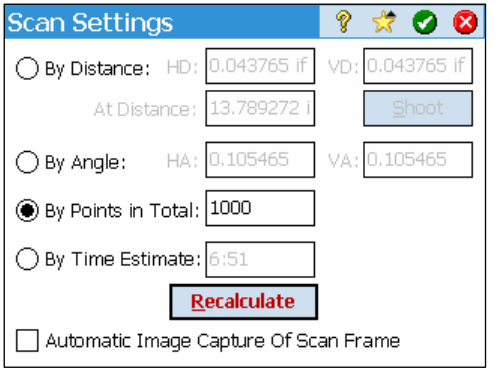
Stop: cancels the scanning process and prompts you if you want to save the partially scanned data or delete it.

Settings: Accesses the Video Scan Settings screen, described below.

Video Scan Settings

Survey | Video Scan

The Video Scan Settings screen is used to configure how many points to shoot within the scan frame. You have a choice to define the number of points by distance between points, angle between points, total number of points, or the time required to shoot all points.


Scan Settings
By Distance: HD: 0.043765 if VD: 0.043765 if
At Distance: 13.789272 i
Shoot
By Angle: HA: 0.105465 VA: 0.105465
By Points in Total: 1000
By Time Estimate: 6:51
Recalculate
Automatic Image Capture Of Scan Frame

By Distance HD/VD: specifies the horizontal and vertical distances between points that are measured within a scan frame.

At Distance: is the distance from the total station to the surface to be scanned.

Shoot: Tap this to measure a new distance for the At Distance field.

By Angle HA/VA: specifies the horizontal and vertical angles the total station will turn to advance to each point within a scan frame.

By Points in Total: is the number of points to shoot within the scan frame.

By Time Estimate: will shoot the number of evenly spaced points within the scan frame to finish approximately in the time entered here.

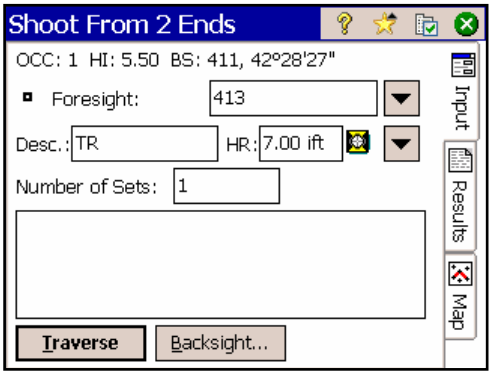
Recalculate: This will recalculate the remaining value(s) in any dependent fields after changes are made.

Automatic Image Capture of Scan Frame: When checked, panoramic photographs within the scan frame are automatically taken after a video scan is performed for viewing within RealWorks along with the video scan data.

Shoot From Two Ends

Survey | Shoot From 2 Ends

The Shoot From 2 Ends screen is used to provide more accurate vertical closure to a traverse. The routine requires that a foresight point is shot, but it is not stored until after it is occupied and another shot is taken to the previous occupy point. The coordinates for the foresight point are computed from an average of data gathered at each occupy point.



: is a shortcut to the Surveying and Repetition Settings screens (Page R-45 and R-53 respectively).

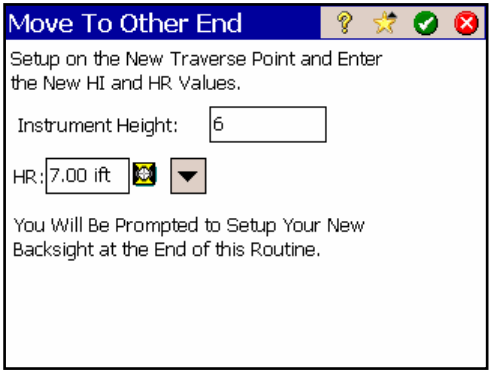
Foresight: is the name given to the next stored point.

Description: is the description given to the next stored point.

HR: is the length of the rod.

: opens the Smart Target options (Page R-449).

Number of Sets: is the desired number of sets required when shooting each foresight. You must select at least one set.


Move To Other End
Setup on the New Traverse Point and Enter the New HI and HR Values.
Instrument Height:
6
HR:
7.00 ift
You Will Be Prompted to Setup Your New Backsight at the End of this Routine.

Traverse: will prompt you to shoot the Foresight point. After each set is performed, the Move To Other End dialog box will open (shown here) and prompt you to set up on the new point and enter a new instrument and rod height. The New Occupy Point dialog box (Page R-127) will open and inform you of the updated points.

BS Setup...: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

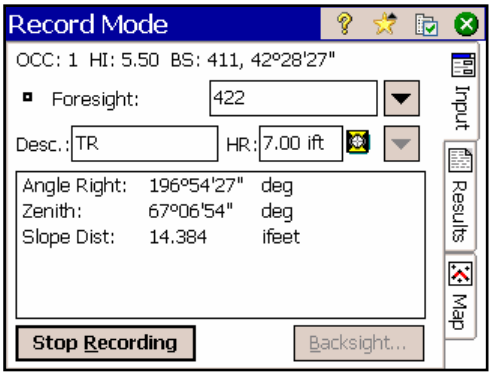
Record Mode

Survey | Record Mode

When running in Record Mode, all control of the total station is performed from the total station's keypad. The data collector will simply log each shot that is taken from the total station.

This routine is typically used for topo work, where the total station remains over a single occupy point during all shots.

Note: Not all total stations support record mode.



: is a shortcut to the Surveying Settings screen (Page R-45).

Foresight: is the point name that will be used when storing the next point. Once a point is stored, it will be incremented to the next available point.

Description: is the description for all the shots that are stored.

HR: is the length of the rod.

: opens the Smart Target options (Page R-449).

Start Recording: starts recording all shots performed from the total station.

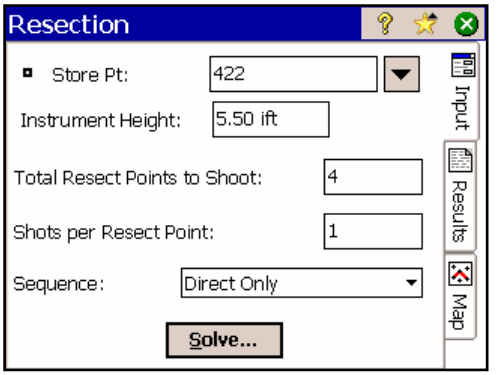
Stop: stops record mode.

Backsight...: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Resection

Survey | Resection

The Resection screen allows you to compute an unknown occupied position by shooting two to seven known positions.



Store Point: is the name that will be used when the new occupied point is stored.

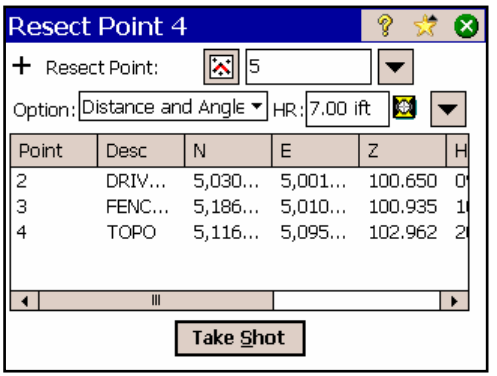
Instrument Height: is the height of the instrument above the ground.

Total Resect Points to Shoot: is the number of known positions that will be shot, from 2 to 7.

Shots per Resect Point: is the required number of shots to shoot to each foresight when Direct Only is selected in the next field and is the required number of sets when Direct and Reverse is selected in the next field.

Sequence: is the set order when shooting each foresight. You can select either Direct and Reverse or Direct Only.

Solve...: opens the Resection dialog box, described below, where all of the shots are performed.



Resection – Screen Two

Resect Point: is the known point that you will shoot.

Option: allows you to select the type of data that is recorded when shooting the specified foresight. You can select Distance and Angle, or if shooting at least three foresights, you can also select to record the Angle Only.

HR: is the length of the rod.

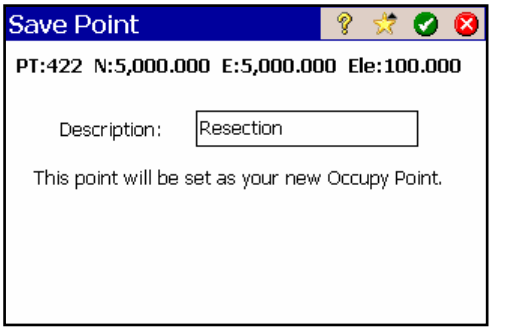
▼: Opens the Smart Target options (Page R-

449).

Take Shot... : Takes a shot to the prism at the specified foresight point. After the last shot is performed, the Save Point dialog box will open, described next.

Save Point

Once the final shot is completed, the Save Point dialog box will open showing the computed coordinates for the occupy point.



Description: is the desired description for the point that will be stored.

: stores the new point and automatically sets the point as the current occupy point.

: exits the dialog **without** storing a new point.

Results

Resection

OC N: is the computed northing of the Occupy Point.

OC E: is the computed easting of the Occupy Point.

OC Z: is the computed elevation of the Occupy Point.

Residuals

dRMS: is the average distance residual from all shots performed.

aRMS: is the average horizontal angle residual from all shots performed.

FS: is the foresight name.

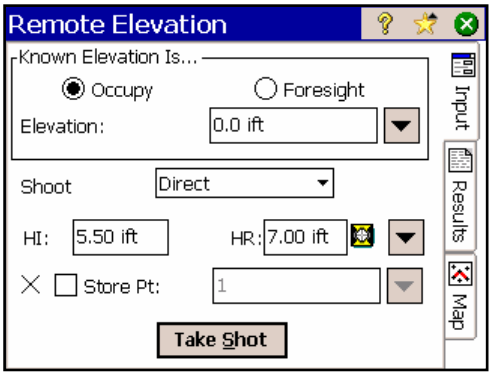
dHD: is the distance difference of the measured shot and the computed shot. d(H)orizontal(D)elta

dHA: is the angle difference of the measured shot and the computed shot. d(H)orizontal(A)ngle

Remote Elevation

Survey | Remote Elevation

The Remote Elevation screen will compute the elevation for the occupy point by shooting a foresight with a known elevation, or it will compute the elevation for a foresight when the occupy elevation is known.



Known Elevation Is...: is where you specify if the Occupy point or the Foresight point has a known elevation.

Elevation: is the known elevation for the selected point.

Shoot: defines if you want to perform a Direct shot only, or Direct & Reverse shots to the foresight.

HI: is the distance that the total station is above the ground.

HR: is the length of the rod.

▼: opens the Smart Target options (Page R-449).

☑ **Store Pt**: When checked, the elevation of the point specified here will be replaced with the computed elevation.

Take Shot...: computes the elevation for the point that had an unknown elevation and optionally writes that elevation to the specified Store Pt.

Results

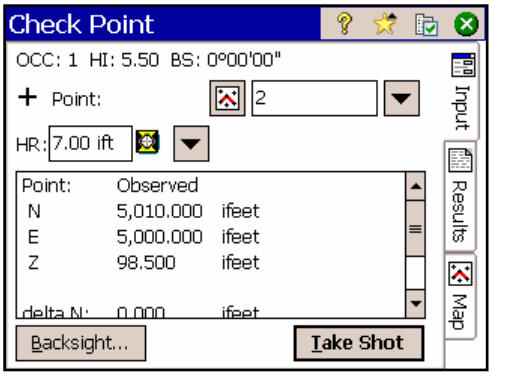
OCC Elevation: displays the elevation for the occupy point.

FS Elevation: displays the elevation for the foresight point.

Check Point

Survey | Check Point

The Check Point screen compares the rod location with an existing point in the project. This routine is similar to the Check Backsight routine (Page R-122) and is used to verify that the rod and/or the total station is over the correct point. This routine does not store a new point.



Point: is the point from the project that will be compared to the observed point (rod location).

Height of Rod: is the length of the rod.

Backsight...: opens the Backsight Setup screen (Page R-118).

Take Shot: takes a shot and displays the deltas between the observed point and the selected point. High delta values can indicate either the rod and/or total station is over the wrong point. The deltas can also be viewed in the Results screen and Map screen.

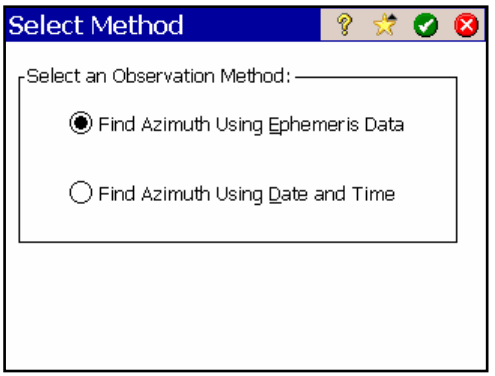
: is a shortcut to the Surveying Settings screen (Page R-45).

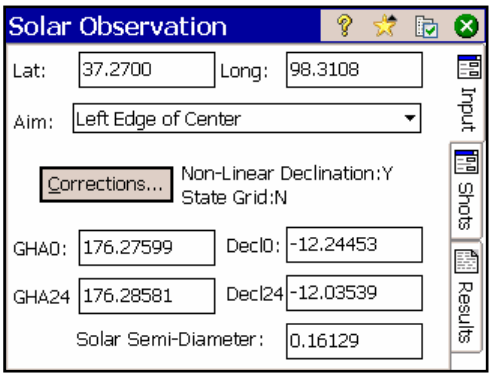
Solar Observation

Survey | Solar Observation

The Solar Observation screen is used to compute the azimuth to an arbitrary backsight based on the position of a celestial body; typically the sun.

WARNING! Direct viewing of the sun without a proper filter will cause serious eye damage. Pointing a total station directly toward the sun without a solar filter can also damage the EDM components.





Find Azimuth Using Ephemeris Data: select this method if you plan to enter data from an ephemeris.

Find Azimuth Using Date and Time: select this method if you do not plan to use an ephemeris.

Note: The fields within the Solar Observations screen will vary depending on the method selected above. All of the fields from each method are described below.

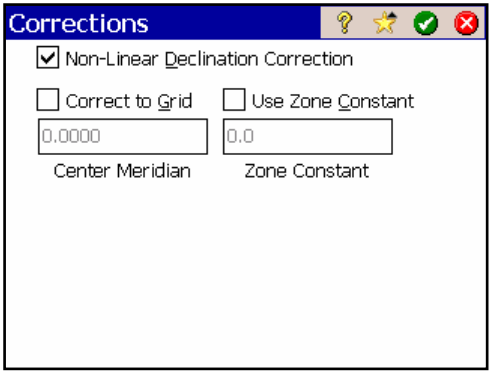
: is a shortcut to the Date/Time Settings screen (Page R-54).

Lat. / **Long.**: is the latitude and longitude of the total station. These values can be scaled from a map, such as a U.S.G.S. 7.5-minute quadrangle sheet or collected with a handheld GPS unit.

Aim: selects the portion of the celestial body that where you intend to aim. You can select Left Edge of Center, Center, or Right Edge of

Center.

Note: Typically Left Edge of Center is selected when performing a sun shot in the northern hemisphere and Center is selected for star shots.



Corrections: displays which corrections are currently selected with an N for no, or a Y for yes. When tapped, the Corrections dialog box opens where the following corrections are configured.

- ☑ **Non-linear Declination Correction**: applies a correction for the linear interpolation of the declination of the sun for the time that an observation is taken. This error is usually negligible, but is removed when this is checked. (This should only be checked when performing sun shots.)
- ☑ **Correct to State Grid**: when selected, the computed azimuth is referenced from the local State Plane grid rather than true north.
- ☑ **Center Meridian** / **Zone Constant**: these values are used to adjust the computed azimuth to the local State Plane grid. Appendix A lists these values for the United States.

GHA0: is the Greenwich Hour Angle of the sun at zero hour Universal Time, Greenwich, on the current date.

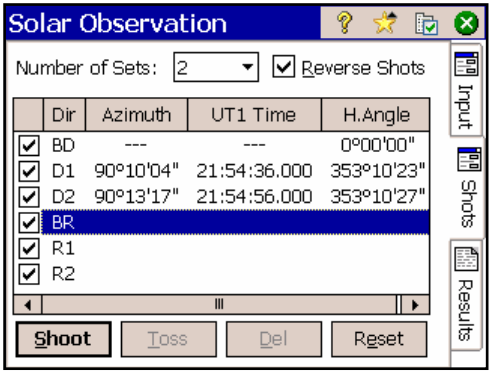
Decl0: is the declination of the sun at zero hour on the current date.

GHA24: is the Greenwich Hour Angle of the sun at zero hour Universal Time, Greenwich, on the following day (24-hours later).

Decl24: is the declination of the sun at zero hour on the following day.

Solar Semi-Diameter: is the semi-diameter of the sun, expressed in minutes and seconds.

Shots



Number of sets: is the number of sets that will be taken to the celestial object.

Reverse Shots ☑: When checked, reverse shots will be required with each set. When unchecked, only direct shots are required.

Shoot: opens the Enter Shot Data screen, described below, where the shot data is entered for the selected observation.

Toss / Incl: will toggle the selected observation so that it will be hidden or un-hidden, respectively. When an observation is hidden, it will not be used when calculating the final azimuth.

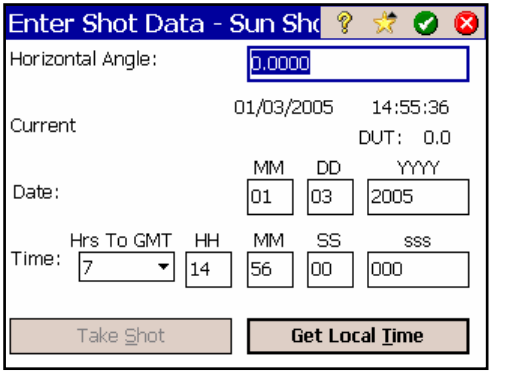
Note: The Toss / Incl buttons perform the same function as checking / un-checking the checkbox in front of each observation.

Note: A backsight observation cannot be tossed.

Del: permanently deletes the most current observation if it is selected allowing you to shoot that shot again.

Reset: permanently deletes all observations. A warning prompt will appear before the observations are deleted.

The Enter Shot Data Dialog Box



Horizontal Angle: displays the horizontal angle measured by the total station. This value is updated with the Take Shot button, described below.

Current Date / Time: displays the current date, time, and DUT. These settings can be changed from the Date/Time Settings screen (Page R-54).

Date: if incorrect, the current date should be entered here.

Time: is where the precise time that the observation occurred is entered.

Hrs to GMT: is the number of hours that the time at the current location differs from Greenwich Mean Time.

Note: The hours to GMT will be between +5 and +8 when in the continental United States.

Take Shot: records the horizontal angle from the total station.

Get Local Time: fills in the Time field with the current time that is set in the data collector. This function is not available when shooting the backsight.

Sun Shot Procedure Summary

1. Point the telescope ahead of the path of the sun and lock the horizontal movement of the total station.
2. Immediately record the horizontal angle from the total station using the Take Shot button.
3. When the target becomes properly aligned with the crosshairs, record the current time as accurately as possible. The time can

be automatically read from the data collector using the Get Local Time button, or measured from an external time piece and manually entered in the appropriate fields.

4. When finished, tap the ✔ button to complete the current observation.

When all observations are complete, the Results page displays the computed azimuth to the backsight.

Results

BS D/R: is the horizontal angle recorded to the backsight for the particular direct/reverse observation.

Azi D/R: is the computed azimuth to the backsight for the particular direct/reverse observation.

Avg: is the computed average azimuth of the backsight, relative to true north.

Grid Avg: is the computed average azimuth of the backsight, relative to the local State Plane grid. This field is only displayed when a state grid correction is applied.

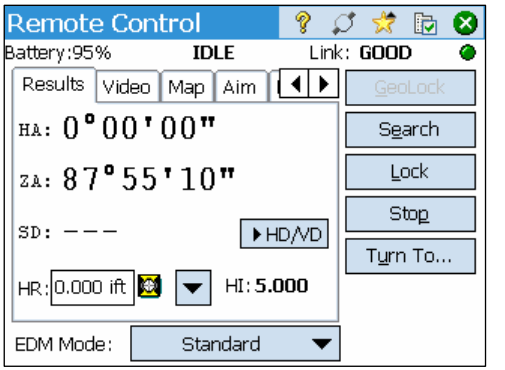
Note: See the User's Manual for more information on the usage of the Solar Observation routine.

Remote Control

Survey | Remote Control

Remote control mode is a special mode that makes it easier for users to control fully robotic total stations from a remote data collector.

Note: The remote control functions are available only after a supported robotic total station is selected and enabled in the Instrument Settings screen.



The Remote Control screen allows you to turn the total station in any direction using the arrow buttons on the keypad and control the tacking functions.

The arrow keys are typically used to get the total station to aim in the general vicinity of the prism prior to initiating a search. The total station will continue to turn in the direction of the button as long as the button remains pressed.

↑: aims the scope upward.

↓: aims the scope downward.

→: turns the scope to the right (as you face the total station from the data collector).

←: turns the scope to the left.

GeoLock: This button is available when GeoLock is enabled and when a supported total station has lost lock on the prism. Tapping it will turn the total station to the area of the prism computed by the GPS solution, followed by a prism search. (See the User's Manual for more information on using GeoLock.)

Search: starts the search routine where the total station searches in a specific pattern until it "sees" the prism and then stops.

Lock: puts the total station in track mode where it will track the movements of the prism.

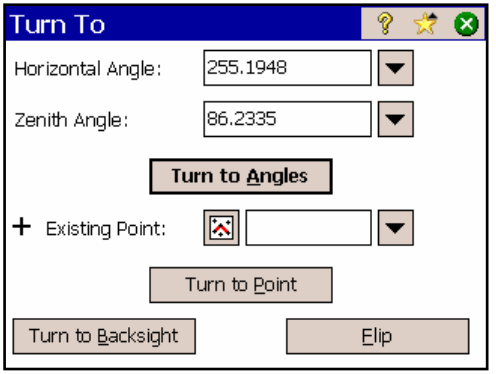
Stop: stops the total station from tracking or searching.

Turn To: opens the Turn To screen (Page R-163) where the total station can be turned to a specified direction or quickly flipped between face one and face two.

EDM Mode: allows you to select from various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

Turn To

Survey | Remote Control | Turn To



The Turn To screen is used to turn a robotic total station to a specified horizontal and zenith angle, or to a specified point.

Horizontal Angle: is the horizontal angle that the total station will turn to.

Zenith Angle: is the zenith angle that the total station will turn to.

Turn to Angles: turns the total station to the specified horizontal and zenith angles.

Existing Point: is the point from the current job that the total station will turn to.

Turn to Point: turns the total station to the specified point.

Turn to Backsight: turns the total station to the backsight point.

Flip: quickly rotates the total station from face one to face two, or vice versa.

Aim: opens a screen where the instrument can be aimed more precisely. (Page R-168)

The satellite icon in the Command Bar indicates the status of the satellite connection when using GeoLock. Tapping this icon will display a pop-up list with the following items:

- **Sky Plot**: opens the Sky Plot screen. (Page R-169)
- **Settings**: opens the GeoLock Settings screen. (Page R-170)
- **Reset**: Resets the GPS localization solution.
- **Sats**: is an output-only field that will display one of the following messages, which will change along with the color of the satellite icon:
  - (green icon) **On - Ready**: GeoLock is active and a localization solution exists.
  - (yellow icon) **On - Collecting Data**: GeoLock is active but a localization solution does not yet exist.
  - (red icon) **No GPS Data** or **GeoLock requires Backsight set**: No NMEA data is available or the backsight has not yet been set.
  - (gray icon) **Off**: GeoLock is not enabled.

Results Card

Survey | Remote Control | Results

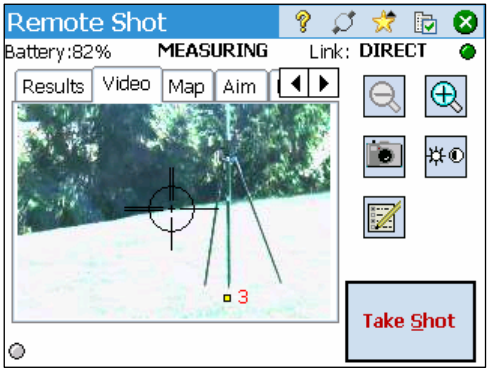
The Results card displays live angle data from the total station and live distance data is displayed depending on the current EDM mode.

HD/VD / ZA/SD : Toggles the data displayed from the total station between HA, HD and VD, or HA, ZA and SD.

Video Card

Survey | Remote Control | Video

This feature is only available when using a supported total station with a USB or supported radio connection, and only on data collectors running Windows Mobile 5.



The Video card displays a live video image from the total station and allows you to adjust the camera/video settings, take a photo, or turn the total station.

Tapping anywhere within the video image will turn the total station to that location. Existing points are overlaid on the screen when they are in view.

Zoom In: will digitally zoom in the image with each tap between four levels from 1x to 4x.

Zoom Out: will zoom out with each tap from 4x back to 1x.

Take Photo: Takes a digital photo and stores the photo to a file.

Brightness/Contrast: Opens a dialog box where the brightness, contrast and white balance can be adjusted.

Video Display Options: Opens the Video Display Options screen, described below, where the look of overlaid points can be customized.

(Green Blinking Light): A blinking green 'light' in the upper right corner indicates a good data feed is being received.

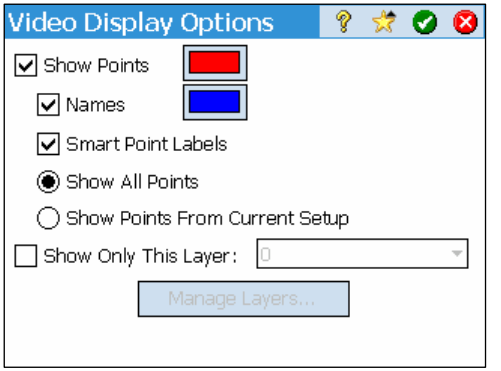
(Red Blinking Light): A blinking red 'light' in the lower left corner indicates a good video feed is being received.

Settings: Accesses the Settings screen where the Video Settings screen (Page R-167) can be accessed.

Video Display Options

Survey | Remote Control | Video

The Video Display Options screen is used to customize the look of points that are overlaid on the video screen.



Show Points: when checked, points will be overlaid on the video screen. The color that fills the small squares that represents the points can be selected with the corresponding color button. When unchecked, no points or point names are overlaid.

Names: when checked, the point name will be shown next to each point that is overlaid on the video screen. The color for the text can be selected with the corresponding color button.

Smart Point Labels: when checked, some point names will automatically be hidden if they overlap other point names in situations where several points are crowded together. For the names that are shown, the associated point graphic will be displayed with a bold border. When unchecked, all point names will be displayed whether or not they overlap other point names.

Show All Points: when checked, all points in the job will be shown if in view on the video display.

Show Points From Current Setup: when checked, only points that were stored from the current backsight setup will be shown.

Show Only This Layer: when checked, only points that are stored on the selected layer will be overlaid on the video screen.

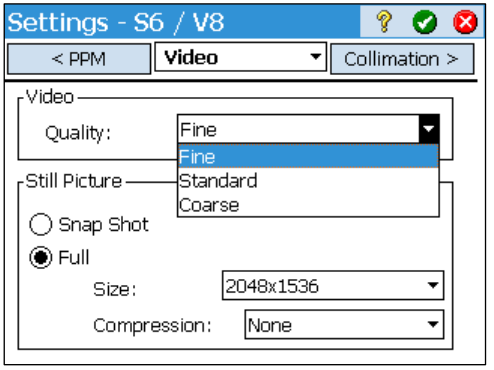
Manage Layers: opens the Manage Layers screen (Page R-87) where the layers can be configured.

Video Settings

Survey | Remote Control | Video | Video

or Job | Settings | Instrument | Instrument Settings... | Instrument Settings | Video

The Video Settings screen is used to configure the quality of the live video image and stored photos.)



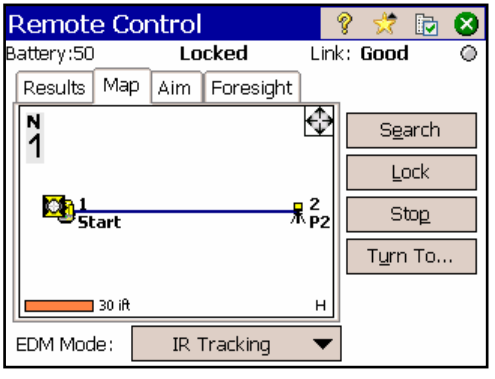
Quality: is used to configure the quality of live video image where Fine produces the best image quality, but takes more time for the video image to refresh.

Snap Shot: results in small images being stored after tapping the button that are equal in size to the live video image.

Full: results in full size digital photos being stored after tapping the button. The desired size can be selected from the Size field. The Compression setting determines the image quality, where less compression will provide more detail, but with a larger file size.

Map Card

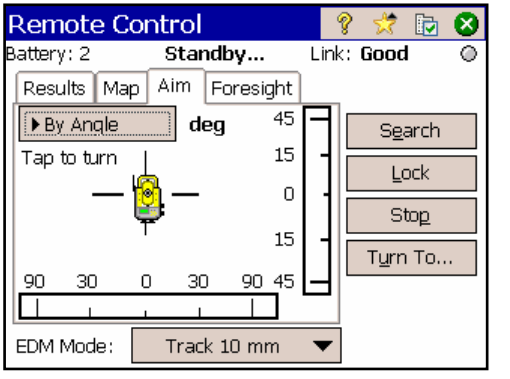
Survey | Remote Control | Map



The Map card displays a live map showing the total station position relative to the current foresight and backsight.

Aim Card

Survey | Remote Control | Aim

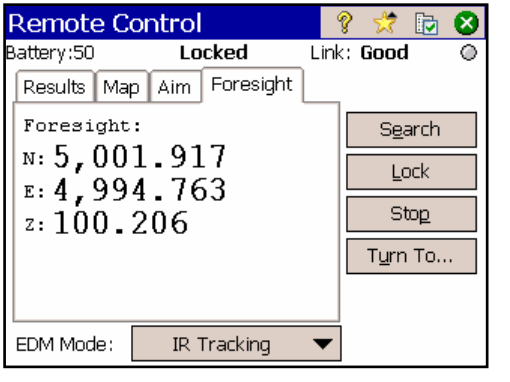


The Aim card is used to precisely aim the instrument. Tapping around the total station graphic will turn the instrument to the location corresponding to the horizontal and vertical scale bars.

▸ By Angle / ▸ By Distance: toggles between turning by angles or by distances, respectively. The scales in the scale bars will also switch between angles or distances. The scales in the scale bars are calculated using the last distance that was measured.

Foresight Card

Survey | Remote Control | Results

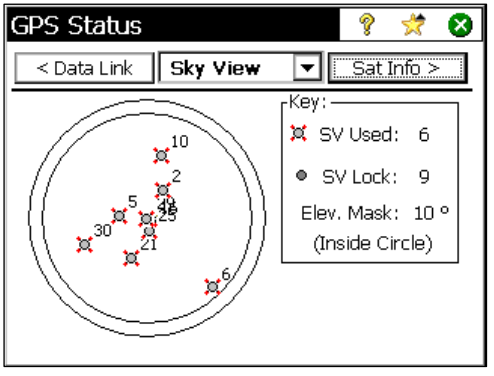


The Foresight card is available only if the backsight is solved. It displays live coordinates for the current foresight.

Sky Plot (available only when using GeoLock)

Survey | Remote Control | **Sky Plot**

The Sky Plot screen displays the relative location of the visible satellites in the sky, as well as if they are being used to calculate a position.



Satellites with a usable signal are shown with red flashing indicators.

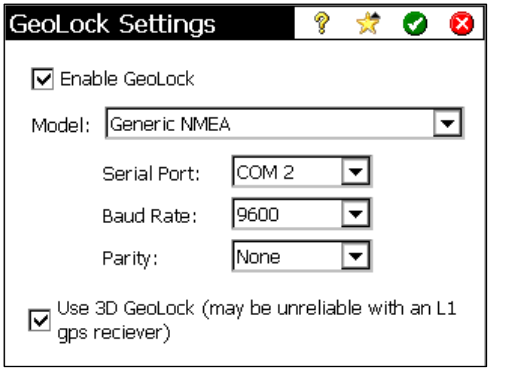
The Elevation Mask is the minimum angle above the horizon where locked satellites are used for a solution. This area is indicated on the screen by the inner circle.

GeoLock Settings

Survey | Remote Control | **Settings**

or Job | Settings | GeoLock

The GeoLock Settings screen is used to enable/disable GeoLock and configure the receiver communication settings.



Enable GeoLock: When checked, enables the GeoLock feature.

Model: Only **Generic NMEA** can be selected, which works for most GPS receivers that output NMEA data.

Serial Port: is the serial port on the data collector used to communicate with the GPS receiver.

Bluetooth...: (Available only when using a Bluetooth GPS receiver and **Bluetooth** is selected for the **Serial Port**.) accesses the Bluetooth configuration screen that comes with the Bluetooth driver software where you can quickly check or change the virtual COM port and favorites. See the User's Manual for more information on configuring Bluetooth.

Baud Rate: is the speed that communication takes place. This must match the baud rate set in the GPS receiver.

Parity: This must match the parity set in the GPS receiver – usually **None**.

Use 3D GeoLock...: When checked, the GPS elevation will also be used to compute your location and adjust the vertical angle of the total station accordingly. GPS is generally less precise vertically than horizontally so unless you are using GeoLock while in very steep terrain, this item should remain unchecked.

Survey Menu – GPS

The Survey Menu while running in GPS mode with the GPS module contains the routines used for RTK data collection and post processing data collection. The menu items are the same regardless of the type of data collection. However, some functions, such as Control Points and Remote Elevation, will only allow you to start when connected to an RTK receiver. Other functions, such as Post Processing, will only allow you to start when connected to a post processing receiver. Finally, the Data Collection function will behave differently based on the receiver type that is active.

A: GPS Status

B: Start GPS Survey

C: Data Collection

D: Control Points

E: Post Processing

F: Base Setup

G: Rover Setup

H: Projection

I: Remote Elevation

J: Import GPS Control

K: Receiver Info

L: Adjust with Projection

M: Projection Calculator

N: File Management

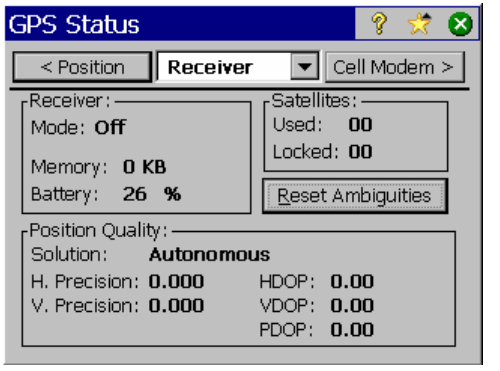
GPS Status

Survey | GPS Status

The GPS Status screen contains several index card-format screens providing real time status of the active receiver.

Receiver

The Receiver card displays information about the receiver mode and GPS solution quality.



Mode: displays if the receiver is set to Off, Base, Rover, or Post Processing mode.

Memory: displays the amount of memory remaining in the receiver's internal storage card.

Battery: displays the remaining battery charge in the receiver.

Satellites: displays the number of satellites:

- **Used**: by the receiver for the current GPS solution.
- **Locked**: (Tracked) by the receiver.

Reset Ambiguities: is used to reinitialize the receiver's RTK engine.

Solution: displays the type and quality of solution. It will be one of the following values:

- **No Communication**: we are not receiving a response to commands.
- **No Data**: we are receiving an unknown or a bad response to commands.
- **No RTK Solution**: we are receiving a response, but the receiver is not computing a solution.
- **Autonomous**: we are receiving a stand-alone solution (accuracy is about 100 meters).

- **Code**: the receiver is calculating a code differential solution (precision is about 1 to 10 meters).
- **Float**: the receiver is calculating a carrier phase differential solution with float ambiguities (precision is typically within 0.1 m to 0.5 m).
- **Fixed**: the receiver is calculating a carrier phase differential solution with fixed ambiguities (precision is typically within 15 mm).

H Precision: displays the root mean squared (RMS) error of the horizontal solution reported by the receiver. It is displayed in project units.

V Precision: displays the RMS error of the vertical solution reported by the receiver. It is displayed in project units.

Note: This value is supplied by the receiver, and Survey Pro displays the receiver's value without modification. Most manufactures report this value at the 2 or 3 sigma level. However, since different manufacturers use different statistical methodology, it is not necessarily valid to compare the RMS values between brands, or even between models with different firmware.

HDOP: displays the Horizontal Dilution of Precision. It is a measure of the geometrical quality of the solution. DOP has no units and lower numbers indicate better solution geometry.

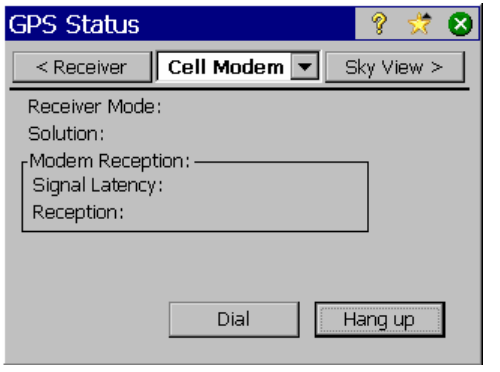
VDOP: displays the Vertical Dilution of Precision. It is a measure of the geometrical quality of the solution.

PDOP: displays the Position Dilution of Precision. It is a combination of HDOP, VDOP and Time Dilution of Precision. It will always be larger than HDOP and VDOP.

Cell Modem

The Cell Modem card displays information about the radio communications and allows you to disconnect or reconnect a cell phone of IP modem connection.

Receiver mode: (see the Receiver Status card, Page R-172.)



Modem Reception: displays two values indicating the data modem signal quality. This information is only displayed if the receiver is in rover mode.

Signal Latency: displays the age of the differential correction used in the current GPS solution. This value should be one second or less for good RTK solutions. If this value is consistently greater than one second, check the data modem link.

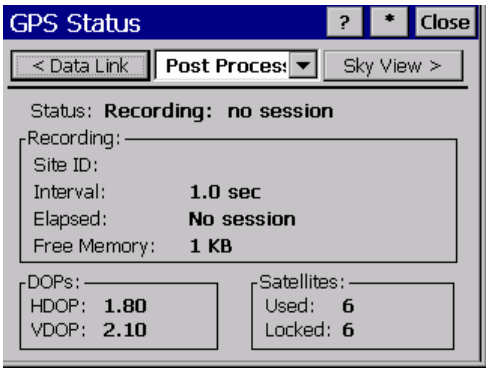
Reception: displays the receiver's estimation of the percent quality of the radio link.

Dial: Dials the cell phone or IP modem using the configuration set in the Cell Phone Settings or IP Modem Settings screen, respectively.

Hang up: Disconnects the cell phone or IP modem connection.

Post Process

The Post Process card displays information about GPS raw data logging for post processing.



Note: Some GPS receivers monitor post processing session status while others simply record event markers in the log file. If your receiver does not monitor sessions, some fields are not displayed.

Status: displays information about the recording. It will be one of four values

- **No Communication**: we are not receiving a response to commands.
- **No Data**: we are receiving an unknown or a bad response to commands.

- **Recording**: a file on the receiver or in the data collector is open and recording GPS raw data. If this receiver monitors sessions, this field will display: session in progress when a session is ongoing.
- **Not Recording**: no file is open and there is no raw data recording.

Last Site ID: displays the Site ID of the current session if a session is in progress. If your receiver does not monitor sessions, the Site ID is the last Site ID used by Survey Pro.

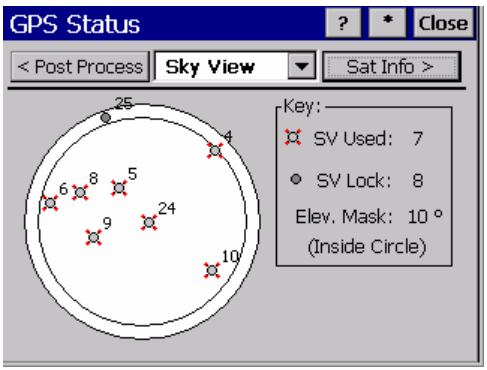
Interval: displays the current recording interval set in the receiver.

Remaining: displays the time remaining in the current session if a session is in progress. This field only shows when your receiver times sessions counting down.

Elapsed: displays the time elapsed since this receiver was put into static mode, if a session is in progress. This field only shows when your receiver times sessions counting up.

Free Memory: displays the amount of memory remaining on the disk where post processing data is stored. This will usually be the receiver's built in memory or the receiver's removable memory card. For some brands and models, this may be disk space on the data collector.

HDOP: / **VDOP**: / **Satellites Used**: / **Satellites Locked**: See the Receiver card Page R-172.



Sky View

The Sky View card displays a plot of the satellites tracked and the elevation mask boundary.

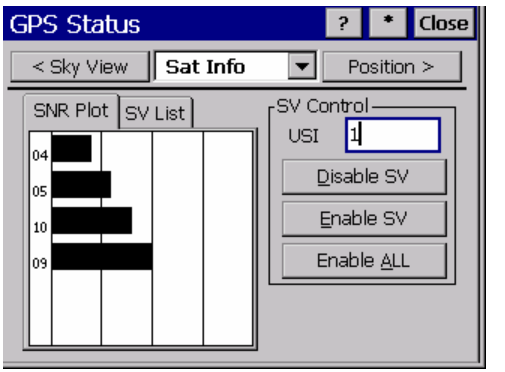
SV Used: **/ SV Lock**: See the Receiver Card, Page R-172

Elev Mask: Displays the elevation mask currently set on the General card of the Receiver Settings screen.

Note: If the receiver setup has not yet been performed, the elevation mask will not be displayed. Also, if you have changed the elevation mask setting, and have not yet reconfigured this receiver, the value you see on this display will be the value from the settings, and not the value the receiver is currently using.

Sat Info

The Sat Info card displays signal quality information for the satellites used by the receiver, and allows you to disable tracking specific satellites, which is useful if the receiver is tracking a 'noisy' satellite.



SNR Plot: This card lists all the satellites that are in view and shows a bar graph that indicates the signal-to-noise ratio. A longer bar indicates more noise, and a lower-quality signal.

USI: is the universal identifier number of the satellite that you wish to disable or re-enable. For GPS satellites, this will be the Pseudo Random Noise (PRN) number and will be between 1 and 37. For GLONASS satellites, this will be the Frequency Channel Number (FCN) + 45, and will be between 45 and 70.

Enable ALL: enable all the satellites that were disabled.

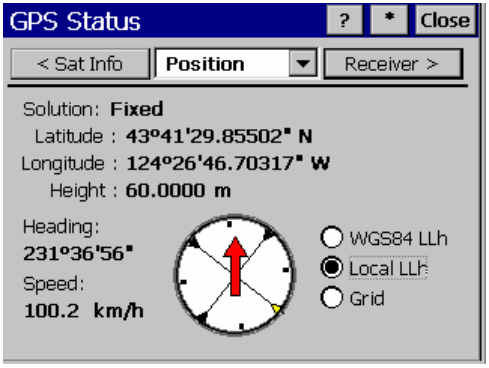
Disable SV: disables the USI entered above. This satellite will then no longer be used in any solution until it is re-enabled.

Enable SV: re-enables the USI entered above.

SV List: This card lists signal quality information for each satellite being used, which is reported by the receiver. The columns available depend on the receiver being used. Consult your receiver's documentation for more information.

Position

The Position card displays your current position as well as your course and speed information if you are moving. The Position card will display one of three coordinates: WGS84 latitude, longitude, height; Local latitude, longitude, height; or Grid north, east, elevation.



Solution: (see the Receiver card on Page R-172.)

Latitude/Longitude/Height: or North/ East/ Elevation: displays the location of the receiver.

Heading: displays your course over ground if you are moving. If your coordinate display is geodetic, this heading is with respect to geodetic north. If your coordinate display is grid, then this heading is with respect to grid north.

Speed: displays your horizontal speed over ground if you are moving.

WGS84: is where you set the position display to show WGS84 latitude, longitude, and height. This option is always available.

Local LLh: is where you set the position display to show Local latitude, longitude, and height. This option is only available when you have a coordinate system selected and solved.

Note: Local LLh numbers make sense when in mapping plane mode. When using Ground – TDS Localization mode, you should not use Local LLh display.

Grid: is where you set the position display to show Grid north, east, and elevation. This option is only available when you have a coordinate system selected and solved.

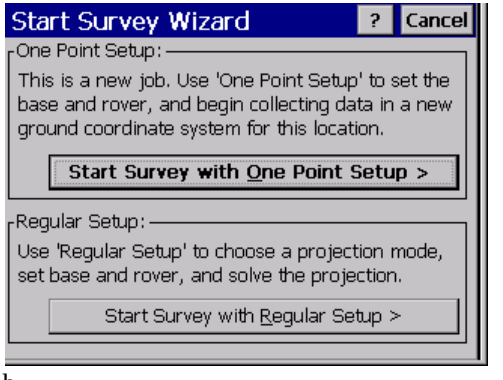
Start GPS Survey

Survey | Start GPS Survey

The Start GPS Survey wizard is used to complete the setup necessary for any RTK GPS Survey. The Start GPS Survey wizard is opened from the main menu, or any time you try to access data collection or stake out functions. The steps to complete the Start GPS Survey wizard will depend on what you have already done in the job. Each possible screen is shown below.

Choose One Point Setup

The Start GPS Survey Choose One Point Setup screen is used to select one point setup mode. This screen shows when you have a new job with only one point, and when you have not yet selected a coordinate system. Use one point setup when you want to start a new survey at ground level, with no extra steps required to solve the coordinate system.

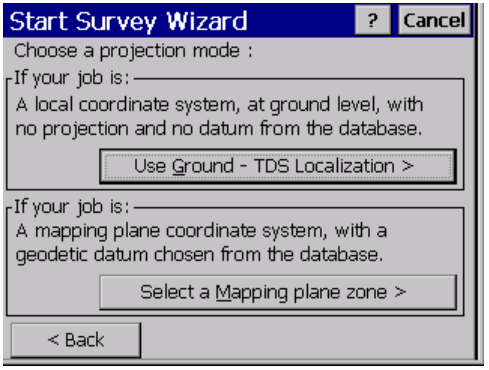

Start Survey Wizard
?
Cancel
One Point Setup:
This is a new job. Use 'One Point Setup' to set the base and rover, and begin collecting data in a new ground coordinate system for this location.
Start Survey with One Point Setup >
Regular Setup:
Use 'Regular Setup' to choose a projection mode, set base and rover, and solve the projection.
Start Survey with Regular Setup >

One Point Setup: displays a description of one point setup mode.

Start Survey With One Point Setup>: opens the Choose Base Setup screen, which will guide you through starting the survey with the default ground coordinate system.

Regular Setup: displays a description of Regular Setup mode.

Start Survey With Regular Setup>: opens the Choose Projection Mode screen, which is used to help you solve the coordinate system for this job.


Start Survey Wizard
?
Cancel
Choose a projection mode :
If your job is:
A local coordinate system, at ground level, with no projection and no datum from the database.
Use Ground - TDS Localization >
If your job is:
A mapping plane coordinate system, with a geodetic datum chosen from the database.
Select a Mapping plane zone >
< Back

Choose Projection Mode

The Start GPS Survey Choose Projection Mode screen is used to select a horizontal projection mode. This screen shows when you have not yet solved a coordinate system for this job.

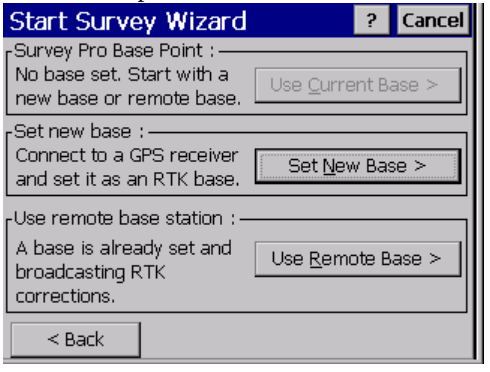
You can choose one of two projection modes, depending on the requirements for your survey.

Use Ground – TDS Localization >: sets the horizontal projection mode to Ground – TDS Localization, and opens the Choose Base Setup screen. Use this mode when you want to do a ground level survey, when there is no projection and no datum to relate your local coordinate system to any geodetic coordinate system.

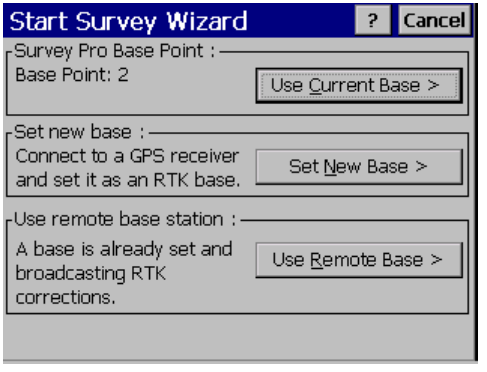
Select a Mapping Plane Zone >: sets the horizontal projection mode to Mapping Plane, and opens the Select Coordinate System screen (Page R-209). Use this mode when you want to use a conformal map projection selected from the coordinate system database file.

Choose Base Setup

The Start GPS Survey Choose Base Setup screen displays your three options to configure the RTK base receiver. This screen is always part of the wizard.


Start Survey Wizard
?
Cancel
Survey Pro Base Point :
No base set. Start with a new base or remote base.
Use Current Base >
Set new base :
Connect to a GPS receiver and set it as an RTK base.
Set New Base >
Use remote base station :
A base is already set and broadcasting RTK corrections.
Use Remote Base >
< Back

Choose Base, no base set


Start Survey Wizard
?
Cancel
Survey Pro Base Point :
Base Point: 2
Use Current Base >
Set new base :
Connect to a GPS receiver and set it as an RTK base.
Set New Base >
Use remote base station :
A base is already set and broadcasting RTK corrections.
Use Remote Base >

Choose base, base already set

Base Point: displays the current RTK base point configured in Survey Pro. If no base is set, this box instructs you to start with one of the other two options.

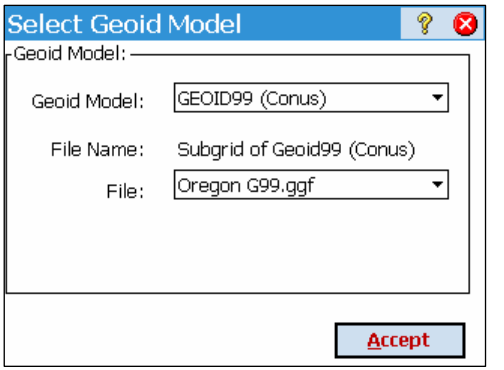
Use Current Base>: skips the Base Setup screen, and opens the next screen required for survey setup. This could be the Rover Setup screen, the Start GPS Survey – Solve Localization screen, or the Data Collection screen.

Set New Base>: opens the Base Setup screen. Use this option when you want to set an RTK base to begin broadcasting corrections, and also possibly begin logging GPS raw data for post processing.

Use Remote Base>: opens the Rover Setup screen. Use this option when an RTK base is already set and broadcasting corrections, or when connecting to an Ntrip server when using VRS and you will start by connecting to a rover to begin the survey.

Select Geoid Model

The Select Geoid Model screen is used to select a geoid model to use with your coordinate system. This screen will open when Set New Base or Use Remote Base is selected in the previous screen and you have not previously selected a Geoid Model.



Geoid Model: is where you select a model to use from the drop down list.

File Name: is where you view the descriptive name from the geoid data file header for the File selected.

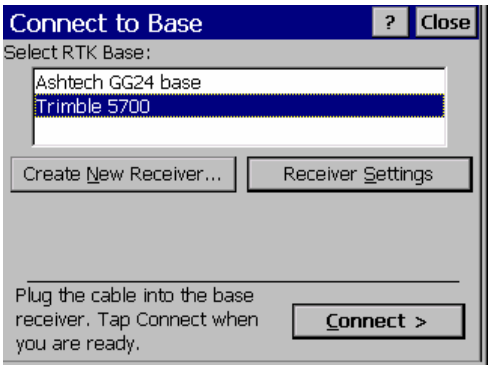
File: is where you view the name of the .GGF data file for the selected geoid, or pick from a list of .GGF files if more than one data file is found for this geoid.

Accept: accepts any change to the Geoid Model selection and returns to the previous screen.

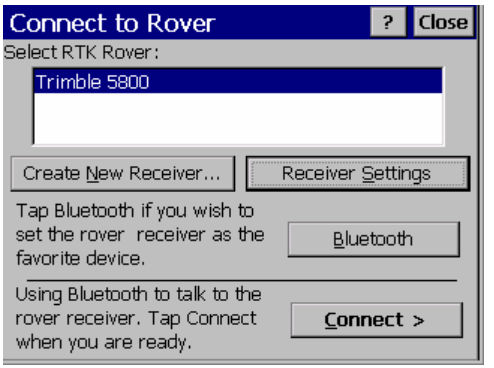
Note: The geoid for the mapping plane zone and the ground localization zone is the same. Changes to the geoid for one record will occur in both.

Connect To Receiver

The Connect to Receiver screen will prompt you to choose and connect to the receiver required for the next step of GPS setup. This screen is always part of the Start GPS Survey wizard. If the next screen is Base Setup, the Connect to Base prompt will display a list of all your RTK base receivers. The last RTK base receiver used by this data collector is selected by default. If the next screen is Rover Setup, Start GPS Survey – Solve Localization, or Data Collection, the Connect to Rover prompt will display a list of all your RTK rover receivers.



Connect to Base


Connect to Rover
?
Close
Select RTK Rover:
Trimble 5800
Create New Receiver...
Receiver Settings
Tap Bluetooth if you wish to set the rover receiver as the favorite device.
Bluetooth
Using Bluetooth to talk to the rover receiver. Tap Connect when you are ready.
Connect >

Connect to Rover with Bluetooth

Create New Receiver...: opens the Receiver Setup screen (Page R-95), where you can define a new base or rover receiver.

Receiver Settings: opens the Job | Settings | Receiver and Post Process screens, where you can change the settings for the current active receiver, activate a different receiver, or change the post processing settings.

Bluetooth...: opens the control panel Bluetooth settings application, where you can set a recognized receiver as the Bluetooth favorite.

This button only shows when the selected receiver is using the Bluetooth port.

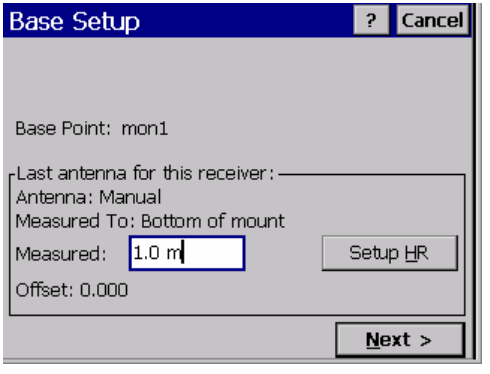
Connect>: sets the selected instrument as the current active instrument, begins communicating with the device, and opens the next setup screen in the Start GPS Survey wizard.

Note: When the current active instrument is Demo Mode, only the Demo Mode receiver will show up in the list. If you are in Demo Mode and you wish to begin surveying with a real receiver, tap Receiver Settings or Create Receiver to activate the desired instrument.

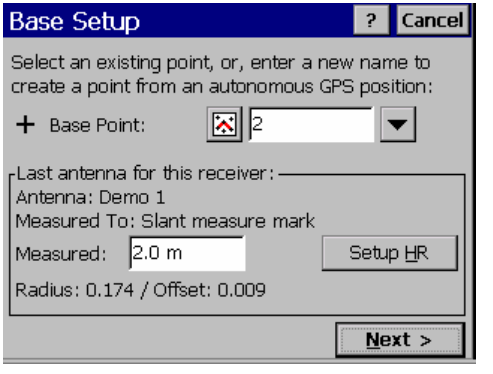
Base Setup

Base Setup One – Pick Base Point

The first Base Setup screen is used to pick the base point and set the antenna height.



Base Setup, standard



Base Setup, one point setup

Base Point: is where you enter the point name that the base antenna is set up over, or displays the name of the remote base point or the name of the one job file point when using one point setup mode. You can enter an existing point, or enter a new point name to start this survey from a new autonomous base setup.

Note: When this screen is used in one point setup mode, the one job file point is automatically used as the base point and you use this screen to enter antenna height. When this screen is used to configure base position in Survey Pro after remote base setup from the rover, then this screen is used to display the base point name and antenna height received from the data modem link.

Antenna: displays antenna setup for this receiver. It will be in one of three states:

- Last Antenna for this receiver: is displayed when you have not yet set the base in Survey Pro. This value is the previous antenna measurement you used with this receiver.
- Selected Antenna: is displayed when you have entered new antenna measurements using the Receiver Antenna screen (Page R-184)
- Antenna Set: is displayed when you have already set the base in Survey Pro, and this receiver was used as the base.

Measured: is where you enter the height of the antenna, measured to the location specified on the Receiver Antenna screen (Page R-184).

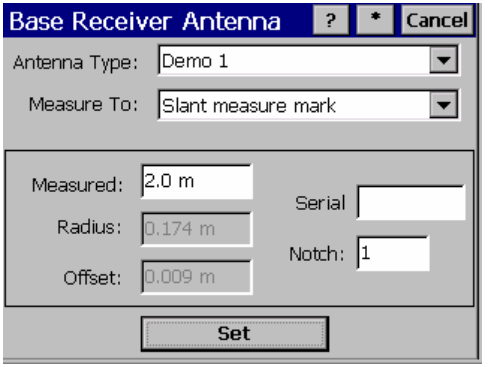
Offset: displays the vertical and/or slant offset values for the selected antenna. Entering antenna offsets is explained on the Receiver Antenna screen, (Page R-184).

Setup HR: opens the Receiver Antenna screen (Page R-184) where the details of the base antenna are defined.

Next >: opens the final Base Setup screen. The final screen depends on the base point you choose:

- If the base point has existing geodetic coordinates, or if they can be computed from 3D plane coordinates and the latest projection solution, the final screen allows you to SET the receiver with the known position.
- If the base point does not have geodetic coordinates or if geodetic coordinates cannot be computed for this point, the final screen is used to GET an autonomous position and set the receiver.

Receiver Antenna



The Receiver Antenna screen is used to define the parameters of the antenna used with the current receiver. This screen may be opened as the Base Receiver Antenna, Rover Receiver Antenna, or the Post Processing Antenna screen.

Antenna Type: is where you select the model of antenna to use. The options available here depend on the current receiver.

Measure To: is where you select method for antenna height measurements. Most antennas have only two choices, measure to bottom of mount, or a visible slant measure mark.

Measured: is where you enter the height of the antenna, measured to the location specified in the Measure To field.

Radius: is where you enter the distance from the antenna's center to the measuring mark on its outer edge.

Offset: is where you enter the vertical distance measured from the Measure To location, to the phase center.

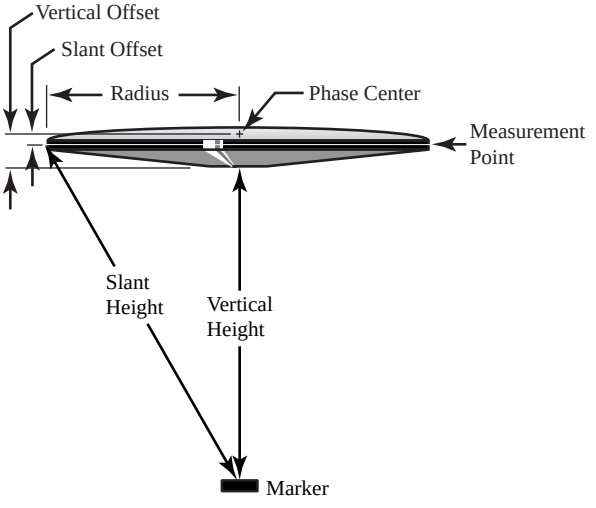
Serial#: is the serial number of the antenna. This information is only written as a note in the raw data.

Notch: Is the notch number on the antenna that you are measuring to.

Note: If your antenna type is Manual, the Radius and Notch fields will not be available

---

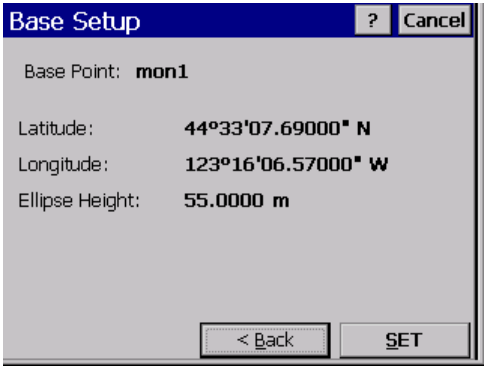
Set: Updates the base antenna settings with the values selected on this screen.



Note: When this screen is used by the RTK rover for updates of antenna height during a survey, the Set button will send the new antenna parameters to the receiver as well as updating Survey Pro's settings.

Base Setup Two – SET

This final Base Setup screen is used to SET the receiver as an RTK base using the job file point as the reference position, and to configure the base location in Survey Pro. This screen is shown when the base point has measured or computed geodetic coordinates in the job.



Base Point: displays the base point name chosen in the previous screen.

Latitude: displays the WGS84 latitude of the job file point.

Longitude: displays the WGS84 longitude of the job file point.

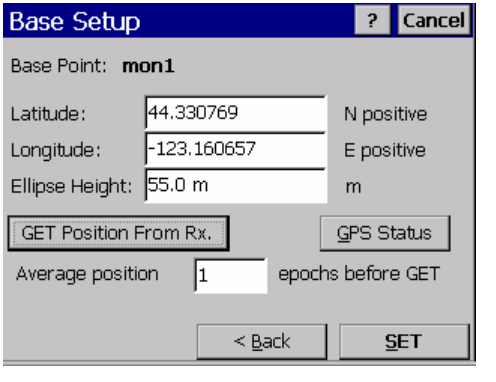
Ellipse Height: displays the WGS84 height of the job file point.

< Back: returns to the previous Base Setup screen.

SET: sets the receiver as an RTK base, and configures the base reference position in Survey Pro. If there is a Recording Interval set on the Job | Settings | Post Process page, a file will be opened and logging of raw GPS measurements for post processing will start. The base name and antenna measurement will be recorded in the file for this static session.

Base Setup Two – GET and SET

This final Base Setup screen is used to GET an autonomous (HERE) position from the receiver, SET the receiver as an RTK base, and configure the base reference position in Survey Pro. This screen is shown when the selected base point does not have geodetic coordinates.



Base Point: displays the base point name chosen in the previous screen.

Latitude: is where you enter the WGS84 latitude for the base point.

Longitude: is where you enter the WGS84 longitude for the base point.

Ellipse Height: is where you enter the WGS84 ellipsoid height for the base point.

Note: You can enter latitude in dd.mmssssss format with north positive, or you can enter dd mm ss.ssssss N/S. You can enter longitude in ddd.mmsssssss format with east positive or you can enter ddd mm ss.sssss E/W.

Average position for ☐ epochs before GET: instructs the receiver to average autonomous positions for this number of epochs before returning.

Get Position From Receiver (Rx.): queries the receiver for an autonomous position and updates the edit boxes.

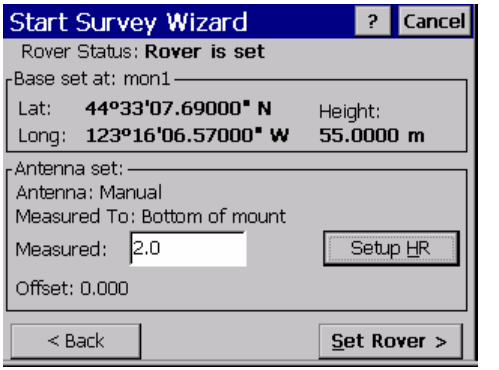
GPS Status: opens the GPS Status screen (Page R-172).

Note: It is highly recommended that you do only one autonomous base setup per job. This will make it much easier to manage the transformation from geodetic to local plane coordinates in your job. It is possible, however, to do multiple autonomous setups in a job. If you do this, each setup is assigned a unique setup group to identify them. See the user's manual for more information on setup groups.

SET: sets the receiver as an RTK base, and configures the base reference position in Survey Pro. If there is a Recording Interval set on the Job | Settings | Post Process page, a file will be opened and logging of raw GPS measurements for post processing will start. The base name and antenna measurement will be recorded in the file for this static session.

Rover Setup

The Rover Setup screen is used to set the RTK rover receiver, and to configure or check the base reference position in Survey Pro.



Rover Status: displays the status of the rover setup in Survey Pro.

Base set at: displays the current base point. This will be empty if the base is not set.

Antenna: displays antenna setup for this receiver. It will be in one of three states:

- Last Antenna for this receiver: is displayed when you have not yet set the rover in Survey Pro. This value is the previous antenna measurement you used with this receiver.
- Selected Antenna: is displayed when you have entered new antenna measurements using the Receiver Antenna screen (Page R-184).
- Antenna Set: is displayed when you have already set the rover in Survey Pro, and this receiver was used as the rover.

Measured: is where you enter the height of the antenna, measured to the location specified on the Receiver Antenna screen (Page R-184).

Offset: displays the vertical and/or slant offset values for the selected antenna. Entering antenna offsets is explained on the Receiver Antenna screen, (Page R-184).

Setup HR: opens the Receiver Antenna screen (Page R-184).

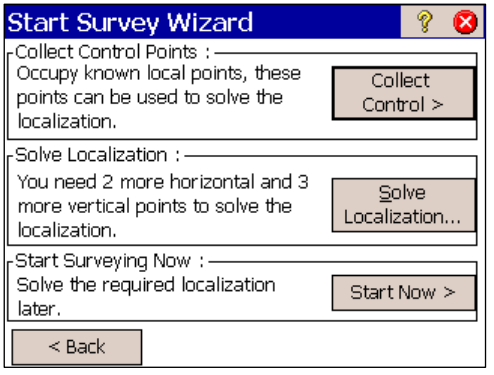
Set Rover: sets the receiver as an RTK rover. If there is a Recording Interval set on the Job | Settings | Post Process page, a file will be opened and logging of raw GPS measurements for post processing will start. This will be a stop and go data file, and the site ID and antenna measurement will be recorded in the file with each point occupation at the rover

The rover receiver will monitor the data link until the base reference position arrives, then Survey Pro will check the point database for a matching point. If you are using a remote base, Survey Pro will find a

matching point or prompt you to store a new point. If you are using the base station you have already set with this data collector, then this check serves as error detection.

Solve Localization

The Solve Localization screen is used to indicate when a horizontal and vertical localization adjustment is required, and to guide you through the steps to collect control points and solve the adjustment.


Start Survey Wizard
Collect Control Points :
Occupy known local points, these points can be used to solve the localization.
Collect Control >
Solve Localization :
You need 2 more horizontal and 3 more vertical points to solve the localization.
Solve Localization...
Start Surveying Now :
Solve the required localization later.
Start Now >
< Back

Collect Control>: opens the Control Points screen, where you can choose local points to use as GPS control points and occupy them with the GPS rover.

Solve Localization: displays information about the current number of GPS control points, and how many more are needed to have the minimum number required to solve the localization.

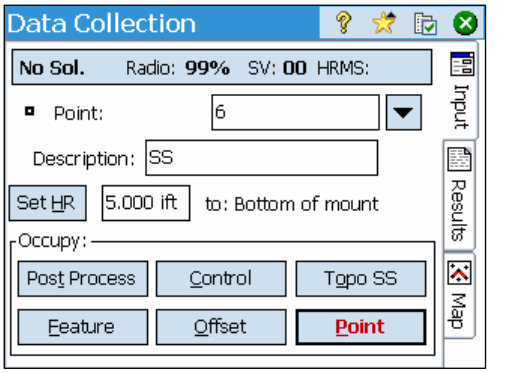
Solve Localization...: opens the Solve Localization wizard (Page R-210).

Start Now >: allows you to start surveying now without localizing. Localization can be performed later, at which time all data collection points will be updated to the proper local coordinates.

Data Collection

Survey | Data Collection

The Data Collection screen is used to collect GPS measurements and store new points in the job.



GPS Status: displays the current solution type, the data modem reception quality, the number of satellites used and the horizontal precision computed by the receiver. When this area is tapped, the GPS Status screen (Page R-172) will open.

Point: is where you enter the point name for the next point to be stored.

Description: is where you enter the description for the next point to be stored.

Set HR: displays the current antenna measurement and measure to setting. You can change the antenna measurement by entering a new value in the edit box. This new antenna height will be sent to the receiver with your next data collection point. You can change both the antenna measurement and measure to setting by tapping on Set HR to open the Receiver Antenna screen (Page R-184).

Post Process: opens the Receiver Session screen (Page R-202), where you can occupy a point for a post processing only session. This allows you log a session in the post processing file using an existing point name without changing that point record in the job file.

Control: opens the Control Points screen (Page R-190).

Topo SS : stores a point with a single epoch of data. The current position is checked against the criteria, and if acceptable, the point is stored.

Note: The Topo SS function never puts the receiver in static mode, so the precision of the rapid side shot will be less than a point occupied in static mode.

Feature: opens the Feature Collection screen, where various automatic and manual data collection options are available.

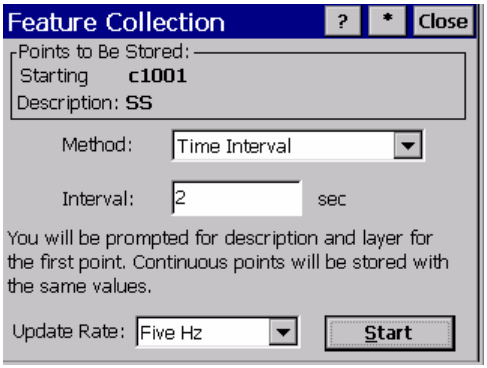
Offset: opens the Offset Shots screen, where a point can be collected and stored at a specified offset.

Point: opens the Occupy Data Points screen (Page R-194), used to occupy and store a new point.

Feature Collection Screen

Survey | Data Collection | Feature

The Feature Collection screen is used when you wish to set up automated continuous data collection.



Points to be Stored: displays the starting point name and description of the group of points to be stored.

Method: is where you select the method of continuous data collection. The available methods are described below:

- **Time Interval**: After accepting the first point, additional points will automatically be stored after the specified time interval (in seconds) has elapsed. Each successive point name is incremented to the next available name.
- **Distance Interval 2D / 3D**: After accepting the first point, additional points will automatically be stored after traveling the specified horizontal or 3D distance. Each successive point name is incremented to the next available name.
- **Hold Still For**: After accepting the first point, additional points are automatically stored when the pole is held in the same spot for the specified interval of time (in seconds).

- **Manual: prompt once**: stores points in the same way as tapping Topo SS from the Data Collection screen, incrementing the point name after each stored point.
- **Manual: prompt every point**: performs the same function as the Manual Prompt Once routine, above, except you are prompted for a new description, layer, and attribute with each point stored.

Interval: is where you enter the interval criteria used for continuous collection modes. The Interval field is not available if either of the manual methods is selected.

Update Rate: is where you set the receiver to One Hz or Five Hz mode. When Five Hz is selected, the receiver will compute positions five times a second so the display will update in near real time and measurement latency will be minimized.

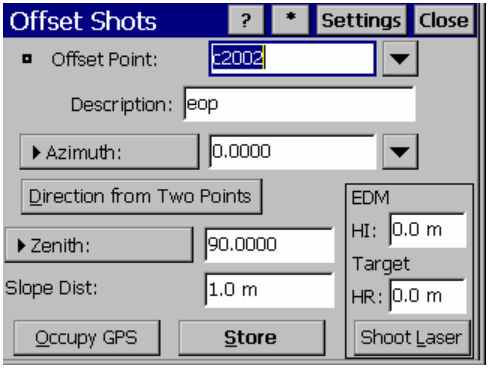
Start: opens the Occupy Data Points screen (Page R-194), where data can be collected.

Note: If you hotkey to another screen while using the Feature Collection routine, the Feature Collection screen will be suspended until you return to it.

Offset Shots

Survey | Data Collection | Offset

The Offset Shots screen is used to collect a point you cannot physically occupy with GPS. You can occupy a nearby point with the GPS rover and then measure the offset distance and direction with tape and compass, or take a shoot with a laser range finder.



Offset Point: is the point name of the offset point to be stored.

Description: is the description of the offset point to be stored.

Azimuth / Bearing: is the direction or bearing from the occupied point to the offset point.

Direction from Two Points: is used to compute the azimuth or bearing from the reference point to the offset point by occupying a second reference point on line with the offset point. Once tapped, a prompt opens for the name to store the reference point followed by the Occupy Data Points screen (Page R-194). After measuring the coordinate at the on line point, you will return to the Offset Shots screen where you will be prompted to pick the direction to the offset point.

Zenith / Vertical Dist: is where you enter the zenith angle or vertical distance from the occupied point to the offset point.

Slope Dist / **Horizontal Dist**: is where you enter the slope distance or horizontal distance from the occupied point to the offset point.

Occupy GPS: is used to occupy the GPS reference point. A prompt for the name of the GPS reference point is followed by the Occupy Data Points screen (Page R-194). After measuring the coordinate at the occupied point, you will return to the Offset Shots screen where new points can be stored with a direction and distance from the occupied point.

Shoot Laser: triggers the selected active conventional instrument to take a shot to the offset. You can select from a number of laser

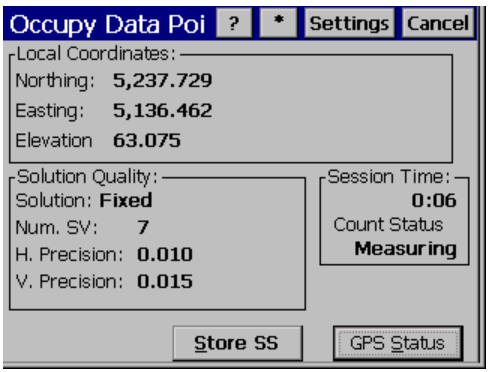
ranger finders available on the Job | Settings | Instrument screen when in conventional mode. The active instrument will always return a zenith and slope distance. The active instrument may return a horizontal angle, which will be treated as an azimuth.

Note: If your laser range finder has a compass, azimuth returned will be magnetic. Use the Instrument Settings screen to set Magnetic Declination to apply to the angle.

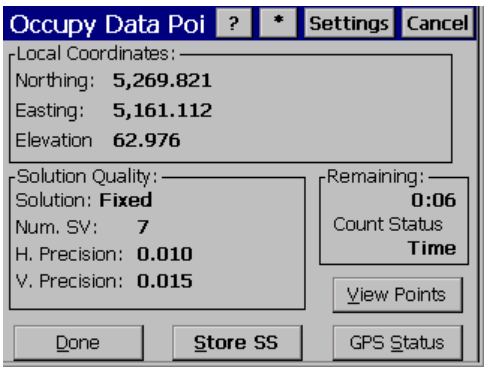
Store: prompts you for a description, layer, and attribute (depending on your survey settings) for the new offset point, and stores the point for the current location.

Occupy Data Points Screen

The Occupy Data Points screen is used to collect measurements to new points. This screen is used to occupy a point, occupy an offset reference point, and for feature collection.



Occupy one Data Point



Continuous Feature Collection

Local Coordinates: displays the local coordinates computed from the current geodetic measurement.

Solution Quality: displays the quality of the current measurement: the solution type, the number of satellites used, and the horizontal and vertical precision computed by the receiver. These values are explained with the GPS Status screen (Page - R172)

Session Time: displays the total occupation time so far for this measurement.

Count Status: displays Measuring when you have current coordinates from the receiver and the screen is updating with the latest measurement. If you are using Epoch Averaging, Averaging is displayed after you tap Store while the number of epochs is averaged in Survey Pro. Suspended is displayed if you are not receiving valid data from the receiver.

Store: prompts you for description, layer, and attribute (depending on your Survey settings) for the new point, then returns to the previous screen.

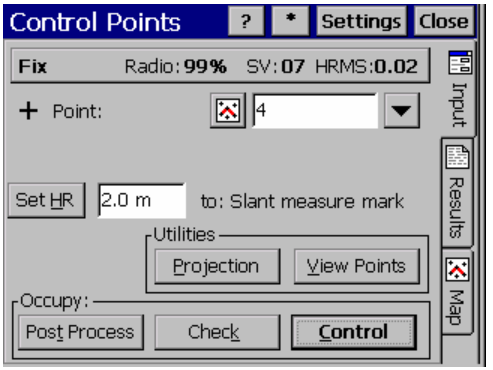
GPS Status: opens the GPS Status screen (Page R-172).

Control Points

Survey Control Points

or Data Collection Control

The Control Points screen is used to measure GPS control points to use in the localization adjustment, or to check the location of exiting points against GPS measurements and the latest coordinate system.



GPS Status: displays the current solution type, radio signal quality, number of satellites used, and the receiver's estimate of the horizontal precision of the current point. If this area is tapped, the GPS Status screen will open (Page R-172).

Set HR: displays the current antenna measurement and measure to setting. You can change the antenna measurement by entering a new value in the edit box. This new antenna height will be sent to the receiver with your next control or check point collection. You can change both the antenna measurement and measure to setting by tapping on Set HR to open the Receiver Antenna screen (Page R-184).

Projection: opens the Projection screen (Page R-204).

View Points: opens the View Coordinates File screen, where the project points can be examined.

Post Process: opens the Receiver Session screen (Page R-202), where you can occupy a point for a post processing only session. This allows you log a session in the post processing file using an existing point name without changing that point record in the job file.

Check: opens the Check Control Point screen, where the local coordinate computed from the measurement is compared to the local coordinate's known value.

Control: opens the Occupy Control Point screen, where geodetic coordinates are measured at a point with local coordinates and added to that point record in the job file.

Check Control Point Screen

Survey Control Points Check Point

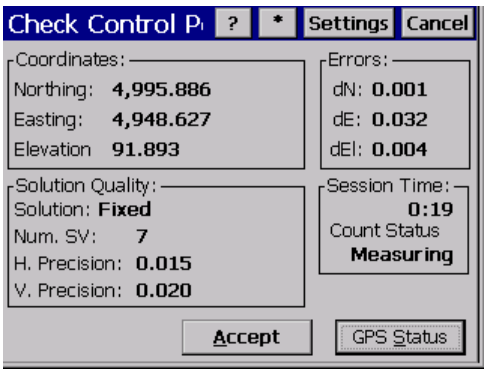
or Data Collection Control Check Point

The Check Control Point screen is used to check a control point. This is done when you want to verify the quality of the coordinate system solution.

Coordinates: displays the local coordinates computed using the current measurement and the latest projection solution.

Solution Quality: displays the quality of the current measurement: the solution type, the number of satellites used, and the horizontal and vertical precision computed by the receiver. These values are explained with the GPS Status screen (Page - R172)

Errors: displays the differences between the computed local coordinates and the known coordinates for the control point.



Note: If the Errors are larger than the measurement precision of the instrument, you probably have a problem with your projection solution.

Session Time: displays the total occupation time so far for this measurement.

Count Status: displays Measuring when you have current coordinates from the receiver and the screen is updating with the latest measurement. If you are using Epoch Averaging, Averaging is displayed after you tap Accept while the number of epochs is averaged in Survey Pro. Suspended is displayed if you are not receiving valid data from the receiver.

GPS Status: opens the GPS Status screen (Page R-172).

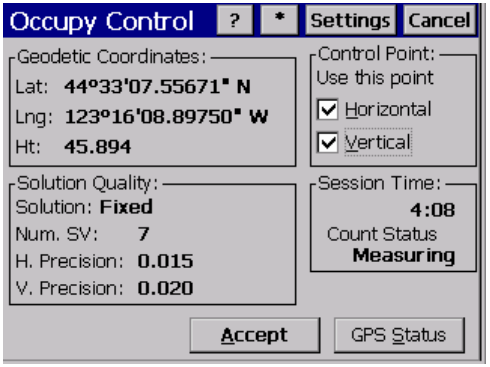
Accept: writes the results to raw data and returns you to the Control Points screen.

Occupy Control Point Screen

Survey Control Points Control or

Data Collection Control Control

The Occupy Control Point screen is used to add geodetic coordinates to a known project point. The most common use of this screen is to measure control points for the localization solution. This screen is also used by the Localization Calculator routine (Page R-214) for one point localization setup.



Geodetic Coordinates: displays the geodetic coordinates measured at the current local point.

Solution Quality: displays the quality of the current measurement: the solution type, the number of satellites used, and the horizontal and vertical precision computed by the receiver. These values are explained with the GPS Status screen (Page - R172)

Control Point: is where you select if the current point is to be used for Horizontal control and/or Vertical control by tapping the appropriate checkboxes.

Session Time: displays the total occupation time so far for this measurement.

Count Status: displays Measuring when you have current coordinates from the receiver and the screen is updating with the latest measurement. If you are using Epoch Averaging, Averaging is displayed after you tap Accept while the number of epochs is averaged in Survey Pro. Suspended is displayed if you are not receiving valid data from the receiver.

GPS Status: opens the GPS Status screen (Page R-172).

Accept: adds the measured GPS coordinates to the point record in the job file, and returns to the Control Points screen.

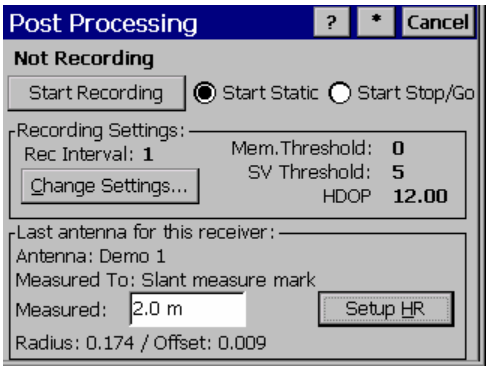
Post Processing

Post processing data collection involves two steps. First, you must open a file and begin logging GPS raw data for post processing. Second, you must measure the antenna height and enter the antenna and station ID for each point you occupy.

Post Processing

Survey | Post Processing

The Post Processing screen is used to open or close a post processing data file, and start or stop logging GPS raw data measurements to the file. When you tap the Post Processing menu button, you are prompted to choose a receiver to connect to from the list of post processing receivers you have created.



Recording Status: displays the current state of receiver recording.

Start Recording / Stop Recording : this button will activate the action which is opposite to the current Recording Status. Tap Start Recording to open a new log file, begin logging raw GPS measurements for post processing to the file, and then open the Receiver Session screen (Page R-202) where you can input the station name and description. Tap the Stop Recording button to close the open log file.

Note: The location of the file is usually on the receiver's built in memory. However, some models support collection of post processing data to a file on the data collector. For those receivers that support it, the location of the log file is specified on the Receiver Settings | General screen.

Start Static: use this setting if you want to start a log file in static mode, where the receiver will remain over a single point for the duration of the session.

Start Stop/Go: use this setting if you want to start a log file in stop and go mode, where the receiver will rove around. In stop and go mode, the GPS raw data is continuously logged to the file to maintain the initialization while roving around, this is the go part. Then, static sessions are marked when the receiver is stationary over a point, this is the stop part.

Recording Settings: this area displays values from the Job | Settings | Post Processing screen.

Change: opens the Job | Settings | Post Processing screen, where you can modify the settings relevant to post processing data collection.

Rec Interval: displays the current recording interval for new logging files.

Mem. Threshold: displays the current minimum memory on disk available before a warning is issued.

SV Threshold: displays the current minimum number of satellites tracked before a warning is issued.

HDOP Threshold: displays the maximum HDOP allowed before a warning is issued

Antenna: displays antenna setup for this receiver. It will be in one of two states:

- Last Antenna for this receiver: is displayed when you have not yet set this receiver in Survey Pro. This value is the previous antenna measurement you used with this receiver.
- Selected Antenna: is displayed when you have entered new antenna measurements using the Receiver Antenna screen (Page R-184)

Measured: is where you enter the measured antenna height (for the specified measure to mark).

Offset: is the reduced offset (slant correction plus phase center offset) for the currently selected antenna type and measure to mark.

Setup HR: opens the Receiver Antenna screen (Page R-184), where you can change the antenna type, measure to mark, and offsets.

Note: The Post Processing screen is used to start logging with post processing receiver types only. If you wish to record post processing data simultaneous with RTK, then you should set the recording interval on the Job | Settings | Post Process screen and then start the base and rover using the Start GPS Survey wizard.

When you tap the Post Processing menu while connected to either the RTK base or rover, you have only two options. If the RTK receiver is already recording data, you are prompted if you wish to close the open logging file. If the RTK receiver is not logging data, you are prompted if you wish to clear the RTK setup and proceed using this receiver for post processing data collection only.

Static / RTK Rover Receiver Session

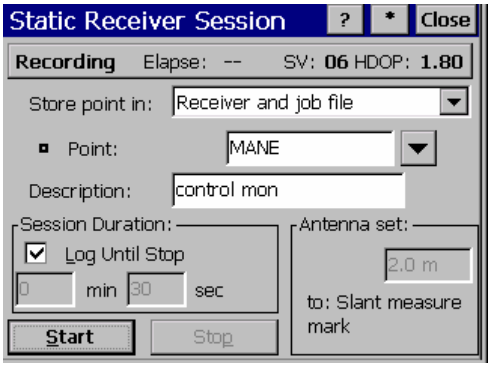
Survey | Data Collection -or-

Survey | Post Processing | Start Recording -or-

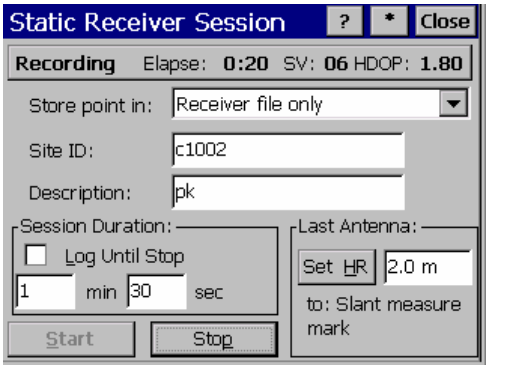
Survey | Control Points | Post Process -or-

Survey | Data Collection | Post Process

The Receiver Session screen is used to enter the station information and antenna height for a post processing data collection session.



Starting a Static Session



During timed stop and go session

Store point in: is used to select how to store this session. You will always get a session recorded in the post processing log file. Select Receiver and job file to store a point record in the Survey Pro .JOB file as well. By default, post processing points will go on the layer selected on the Job | Settings | Post Process screen.

Note: If you are using this screen with the RTK rover, you can only store points in the post processing log file from this screen. Use the RTK Data Collection screen to store points in Survey Pro simultaneously with points logged to the post processing file.

Point (or) Site ID: is where you enter the station name for the static session or stop and go point.

Note: If you are storing this point in Survey Pro, the screen will look like the picture above, and you can pick points using the Survey Pro compound point control. If you choose an existing point, you will be prompted to rename or overwrite, just like RTK data collection. If you are storing this point in the receiver file only, then the point control is replaced with a simple edit box. When storing to receiver only, you can reuse an existing point name without modifying that point in the Survey Pro job file.

Description: is where you enter the description for the static session or stop and go point.

Log Until Stop: is where you select to use a Duration or to record until Stop is tapped.

Duration: is where you enter the session length for the next occupation.

Set HR: displays the current antenna measurement and measure to setting. You can change the antenna measurement by entering a new value in the edit box. This new antenna height will be sent to the receiver with your next control or check point collection. You can change both the antenna measurement and measure to setting by tapping on Set HR to open the Receiver Antenna screen (Page R-184).

Note: The Set HR button is only available if this is a stop and go post processing session, or an RTK rover session.

Start: sets the receiver to mark the beginning of a static point occupation with the entered Site ID and Description.

Stop: sets the receiver to mark the end of a static point occupation.

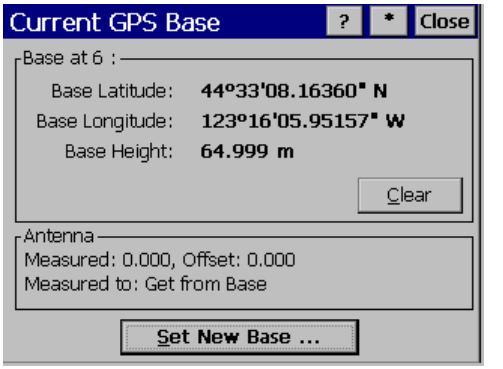
Status: opens the GPS Status screen (Page R-172).

Base Setup

Survey | Base Setup

The Current GPS Base screen displays the position of the current RTK base reference position used by Survey Pro. It can be used to open the Base Setup wizard, which can set an RTK base receiver to begin broadcasting differential corrections, and configure the base reference position in Survey Pro

When you tap the Base Setup menu item, the Current GPS Base Station information screen is displayed.



Base Point: displays the current base point name, if set.

- **Latitude**: displays the current latitude of the base point set in Survey Pro.
- **Longitude**: displays the current longitude of the base point set in Survey Pro.
- **Height**: displays the current height of the base point set in Survey Pro.

Antenna: displays information about the antenna if it is available.

Set New Base: prompts you to choose a base receiver to connect to, and opens the Base Setup wizard where you can set the RTK base and configure the base reference position in Survey Pro. The Base Setup wizard is described as part of the Start GPS Survey wizard (Page R-182).

Clear: clears the existing base setup. This is usually not done, but may be required if you wish to edit the base point using the Edit Points screen from the Job menu. You will have to reset the RTK base and rover in Survey Pro before you collect more data.

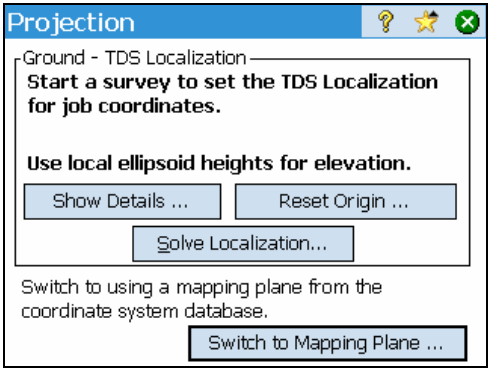
Rover Setup

Survey | Rover Setup

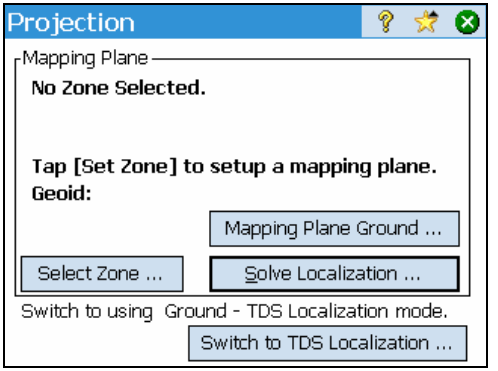
The Rover Setup screen is used to set an RTK rover to begin receiving differential corrections and to configure or check the base reference position in Survey Pro. The Rover Setup screen is described as part of the Start GPS Survey wizard.

Projection

Survey | Projection


Projection
Ground - TDS Localization
Start a survey to set the TDS Localization for job coordinates.
Use local ellipsoid heights for elevation.
Show Details ...
Reset Origin ...
Solve Localization...
Switch to using a mapping plane from the coordinate system database.
Switch to Mapping Plane ...

Ground TDS Localization Mode



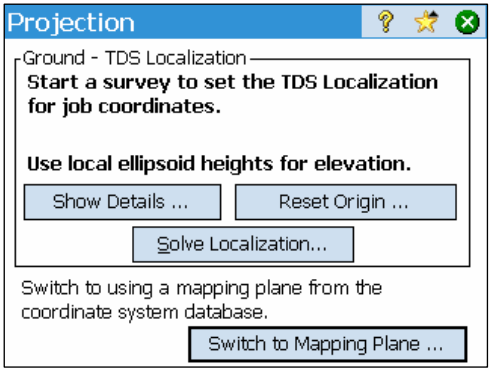
Mapping Plane Mode

The Projection Information screen is used to select and solve the horizontal and vertical projections, which are used to transform GPS measured WGS84 coordinates (latitude, longitude, height) into local coordinates (North,East,Elevation). The upper portion of the screen displays the status and details on the current projection mode.

The screen is also used to switch between mapping plane and localization mode. The buttons available will vary depending on the current projection mode. TDS Localization mode is described in detail starting on Page R-206 and Mapping Plane mode on Page R-218.

Projection – TDS Localization Mode

The Projection screen is described below for when the horizontal projection mode is set to TDS Localization.


Projection
Ground - TDS Localization
Start a survey to set the TDS Localization for job coordinates.
Use local ellipsoid heights for elevation.
Show Details ...
Reset Origin ...
Solve Localization...
Switch to using a mapping plane from the coordinate system database.
Switch to Mapping Plane ...

Use this setting when you want ground level coordinates, and there is no projection and no datum to define a geodetic coordinate transformation. In this mode, a default map projection is created with your first RTK base setup. You collect GPS measurement on points with known local coordinates, and solve a Localization adjustment. The Localization adjustment will translate, rotate, and scale the default map projection's (y,x) into your local coordinates (N,E).

Show Details...: opens the Projection Details screen, where the complete details of the localization solution, reference map projection, and Geoid model are displayed.

Reset Origin...: opens the Localization Set Zone screen (Page R-207), where you can enter the parameters of the intermediate mapping plane to be used for the localization adjustment.

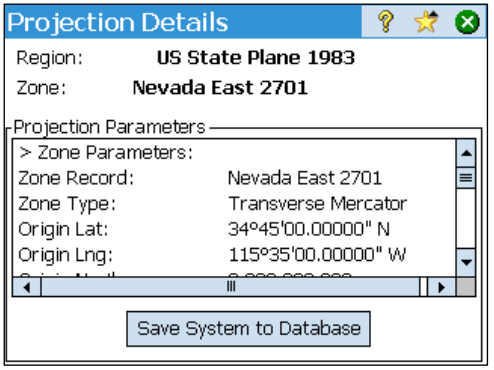
Note: This step is usually not necessary, since the intermediate mapping plane is automatically set up by default using the location of the first RTK base setup in this job. However, if the first base is far away (more than 10km), or it is considerably higher or lower (+/- 200m) you may wish to enter the parameters of the intermediate mapping plane.

Solve Localization...: opens the Solve Localization wizard (Page R-210), where control points can be selected and the horizontal and vertical localization are solved.

Switch to Mapping Plane...: switches the horizontal projection mode from Ground – TDS Localization to Mapping Plane (Page R-218).

Projection Details

Survey | Projection | Show Details...

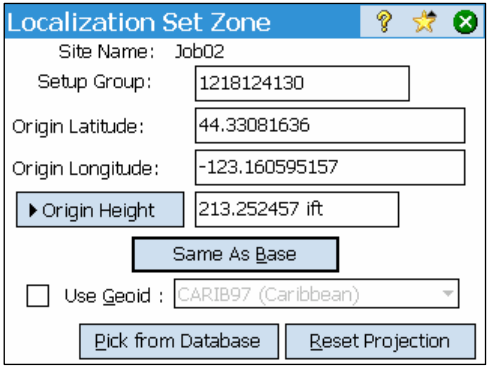


Save System To Database: will save the current projection record to a coordinate system database file. First, the current database file is checked for a matching record, and if found you will be prompted that you need not save the current coordinate system. If no matching record is found, then the current coordinate system will be saved as a new record. If a different record with the same name is found, you will be prompted to rename the current record before you can save.

Localization Set Zone

Survey | Projection | Reset Origin...

The Localization Set Zone screen is used to manually configure the parameters of the localization reference stereographic projection. It is also used to select the geoid model to use with localization coordinate systems.



Zone / Site Name: displays the name of the current initialized localization zone or the solved localization site.

Setup Group: is where you enter the set up group of the reference stereographic mapping plane.

Origin Latitude: is where you enter the origin latitude of the reference stereographic mapping plane. This is usually set at the latitude of the first base location.

Origin Longitude: is where you enter the origin longitude of the reference stereographic mapping plane. This is usually set at the longitude of the first base location.

Origin Height / Origin Scale: is where you enter either the height or the scale factor used to reference the localization system to ground level.

Same as Base: updates the values with the coordinate and set up group of the GPS base station.

Use Geoid: is where you choose to use a geoid model with this zone. When this box is checked, you can select a geoid model from the dropdown list to use with the coordinate system. When this box is unchecked, no geoid will be used with the coordinate system. You can pick a geoid model from the database using the drop down box.

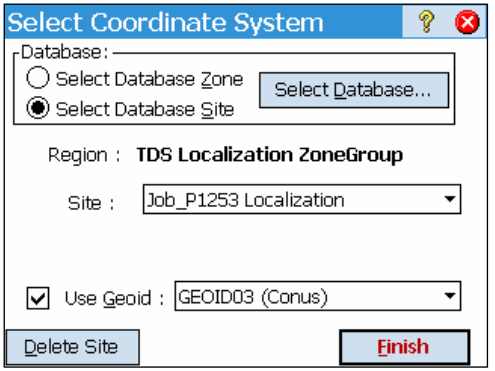
Pick from Database: opens the Select Coordinate System screen (Page R-209) where you can pick a reference stereographic map projection zone or a solved localization site from the coordinate system data base file (.csd).

Reset Projection: initializes a new localization reference stereographic map projection with the input parameters.

Note: To simply assign a geoid to use with the TDS Localization coordinate system, which will be set up automatically with your first base, leave all fields of this screen empty and tap Reset Projection. The geoid setting will be applied to the coordinate system setup automatically with your first base setup.

Select Coordinate System

Survey | Projection | Reset Origin... | Pick from Database

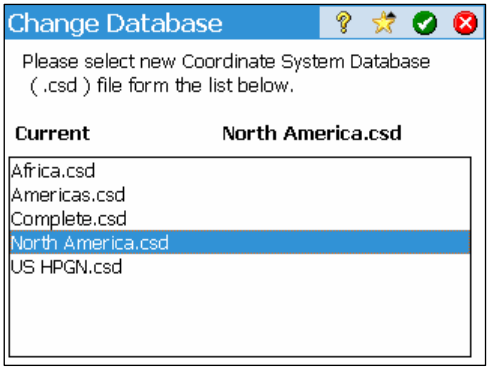


The Select Coordinate System screen is used to pick a Ground – TDS Localization mode default zone or solved localization site from the database file.

This screen is described in detail in the Mapping Plane mode projection section on Page R-220. The difference when in Ground – TDS Localization mode is that you can only select records from the TDS Localization Region collection.

Select Database

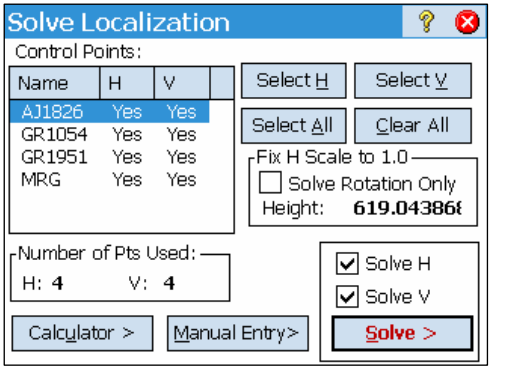
Survey | Projection | Reset Origin... | Pick from Database | Select Database...



The Select Database screen is used to select the coordinate system database to use. This screen will list all of the coordinate system database files (*.csd) you have in the Survey Pro directory. Highlight the .csd file you wish to use and tap ✔ to load the selected coordinate system database file.

Solve Localization

Survey | Projection | Solve Localization...



The Solve Localization wizard is used to solve a horizontal and vertical adjustment for a coordinate system. The user interface and procedure to solve a localization in Ground – TDS Localization mode and Mapping Plane mode are very similar. This section explains how to solve a horizontal and vertical adjustment in either projection mode.

Solve Localization – Control Points

The Solve Localization Control Points screen is used to pick control points for a least squares localization solution, or to key in parameters for a manual localization solution.

A list of all occupied control points matching the current base set up group is displayed. If a point is to be used in the horizontal and/or vertical transformation solution, a Yes will appear in the H and/or V column for that point. If it is not to be used in the solution, that field will be blank.

Each point can be selected for horizontal or vertical control by tapping the corresponding column or pressing the [H], or [V] key on the keypad. You can double tap on a point to display information about that point.

Select H: selects the currently highlighted point as horizontal control in the least squares solution.

Select V: selects the currently highlighted point as vertical control in the least squares solution.

Select All: selects all of the control points to be used in the least squares solution.

Clear All: un-selects all of the control points.

Fix scale to 1.0: check the Solve Rotation Only control to constrain the least squares solution to a scale of 1.0. Do this when you want to orient your GPS to an existing grid but you want to hold the scale of the GPS measurements.

Note: You must choose exactly two horizontal control points for a fixed scale localization.

Solve H: check Solve H to use the selected control points in a least squares solution or to use the horizontal values from the manual entry card.

Solve V: check Solve V to use the selected control points in a least squares solution or to use the horizontal values from the manual entry card.

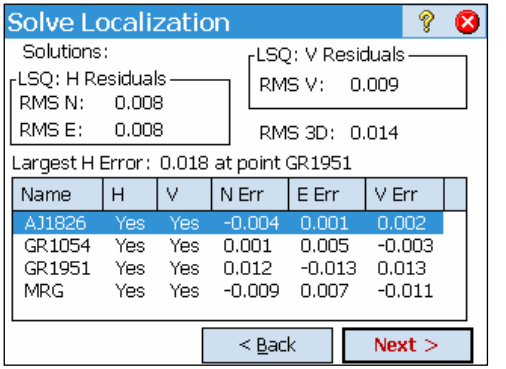
Manual Entry>: opens the screens used to manually enter a set of localization parameters for a horizontal and/or vertical solution.

Calculator>: opens the manual entry screens in Localization Calculator mode. This interface, only available when using Ground – TDS Localization horizontal mode, is used as one technique to do one-point setups on new jobs.

Solve >: computes the localization parameters using the least squares solution with the selected control points, then opens the Residuals screen.

Solve Localization – Residuals

The Solve Localization Residuals screen is used to display the residuals from the least squares solution, and to change your control point selections and re-solve the adjustment if desired.


Solve Localization
Solutions:
LSQ: H Residuals
RMS N: 0.008
RMS E: 0.008
LSQ: V Residuals
RMS V: 0.009
RMS 3D: 0.014
Largest H Error: 0.018 at point GR1951
Name H V N Err E Err V Err
AJ1826 Yes Yes -0.004 0.001 0.002
GR1054 Yes Yes 0.001 0.005 -0.003
GR1951 Yes Yes 0.012 -0.013 0.013
MRG Yes Yes -0.009 0.007 -0.011
< Back
Next >

Solutions: The box for horizontal and vertical solution will display the root mean squared results. If the solution is from a least squares calculation with residuals, the RMS values are from the residuals of each point used in the calculation. If the solution is unique (minimum number of control points or fixed horizontal scale), the RMS values are from the misclosures of each point not used in the calculation.

RMS 3D: displays the 3D RMS calculated from the square root of the horizontal RMS squared plus the vertical RMS squared.

Largest H Error: displays the name of the point with the largest horizontal error (if a horizontal solution was calculated).

A point list of all control points is displayed along with the residual or misclosure for each point (depending on least squares solution or unique solution). You can change the points used in the solution and re-solve on this page to display the new residuals or misclosures.

< Back: returns to the Solve Localization – Control Points screen.

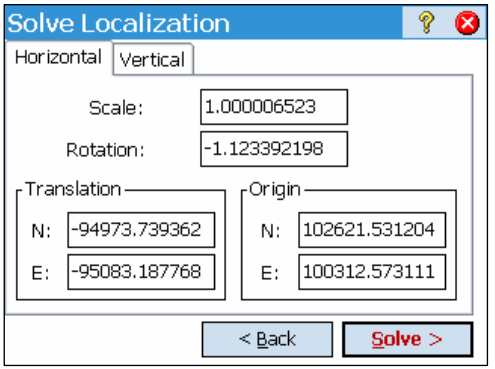
Solve >: is displayed when the point list has changed. Tapping solve will recalculate the parameters and display new residuals or misclosures for the control point list.

Next >: advances to the Solve Localization – Results screen.

Solve Localization – Manual Parameters

The Solve Localization Manual Parameters screen is used to input localization horizontal and vertical parameters by hand. This can be done to copy a localization solution between data collectors in the field, or to recreate a localization solution from a raw data printout.

Horizontal Card



The Horizontal card is used to manually enter the six parameters of the horizontal localization solution.

Scale: is where you enter the scale factor.

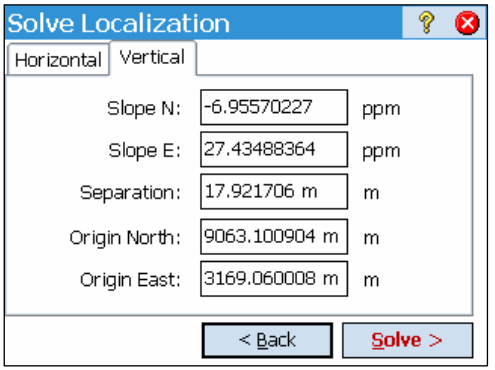
Rotation: is where you enter the rotation angle.

Translation (N,E): is where you enter the horizontal shift (N,E) from the intermediate map projection to the local coordinate system.

Origin (N,E): is where you enter the horizontal coordinate (N,E) of the localization control points.

Vertical Card

The Vertical card is used to manually enter the five parameters of the vertical localization solution.



Slope N: is where you enter the slope of the inclined plane along the local north grid axis in parts per million.

Slope E: is where you enter the slope of the inclined plane along the local east grid axis in parts per million.

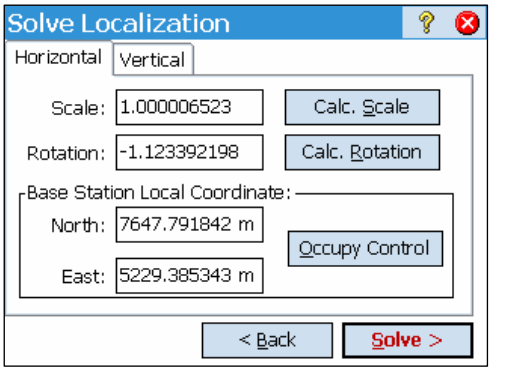
Separation: is where you enter the separation between the inclined plane and the local elevation.

Origin N / E: is where you enter the local origin (north,east) of the inclined plane.

Solve >: updates the localization solution using the values entered on the Horizontal and/or Vertical cards.

Localization Calculator

This sub section describes a feature available only in Ground – TDS Localization mode.



The Localization Calculator is used to enter the horizontal localization parameters using the pre-Survey Pro 3.5 procedure.

Scale: is where you enter the scale factor used to transform distances on the localization mapping plane to your project coordinate system.

Note: Using versions of Survey Pro after 3.5, the localization scale should be very close to 1.0. See the user's manual for a more detailed explanation of localization scale values.

Rotation: is where you enter the rotation angle used to transform the orientation of the localization mapping plane to your grid orientation of your project.

Calc. Scale: opens the Localization Calculator screen where the horizontal scale factor is explained.

Calc. Rotation: opens the Localization Calculator screen where the rotation can set parallel to a mapping plane selected from the database.

Base Station Local Coordinate: are the local plane coordinates of the base. If you set up on a new base point, these fields are blank and you need to occupy one control point to calculate the base station local coordinates.

Occupy Control: opens the Control Points screen (Page R-190), where you select a control point to occupy. When you are done, the base local coordinate is calculated using your entered scale and rotation.

Solve >: computes the horizontal localization parameters using the entered scale, rotation, and base station local coordinates.

Localization Calculator – Scale

Note: This function is no longer necessary with Survey Pro versions after 3.5. The new localization solution sets the origin scale of the reference stereographic mapping plane based on ground height. This screen was left in to explain scale factor to users who previously used this work flow.

Use 1.0 Scale: returns to the Localization Calculator screen with a scale factor of 1.0.

Localization Calculator – Rotation

In order to compute the localization rotation, you need a known geodetic coordinate system for reference. Use this function to set the localization coordinate system parallel to a selected mapping plane.

The calculate rotation function uses the Projection Calculator screen (Page R-242).

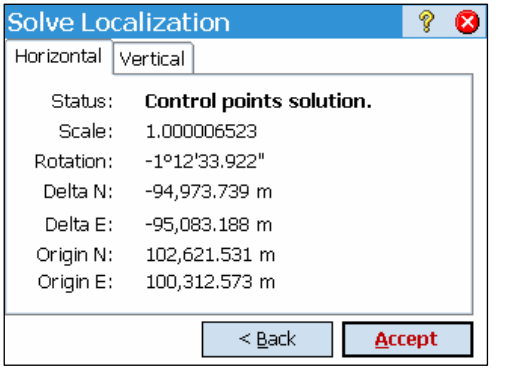
Note: Survey Pro versions prior to 3.5 allowed users to calculate rotation using either a known mapping plane, or relative to the first base setup. This function is now used only to calculate orientation from a known mapping plane. Older jobs that had orientation relative to the first base were automatically converted into a localization solution when first opened with Survey Pro versions after 3.5.

Solve Localization – Results

The Solve Localization Results screen is used to display the results of the horizontal and vertical adjustment, and how the adjustment was derived.

Horizontal Card

The Horizontal card shows results of the horizontal localization solution.



Status: displays the status of the current horizontal solution. This will be one of the following:

- Control points solution: is displayed when the parameters were calculated from the selected control points.
- Current horizontal site: is displayed when there is a horizontal solution and Solve H was not selected on this pass.
- No horizontal solution is displayed when there is no horizontal solution in Ground- TDS Localization mode. This happens when you tap Solve H, and no control points are selected.
- Unadjusted Mapping Plane: is displayed in Mapping Plane mode when there is a mapping plane zone selected, but no horizontal adjustment is solved.

Scale: displays the scale factor.

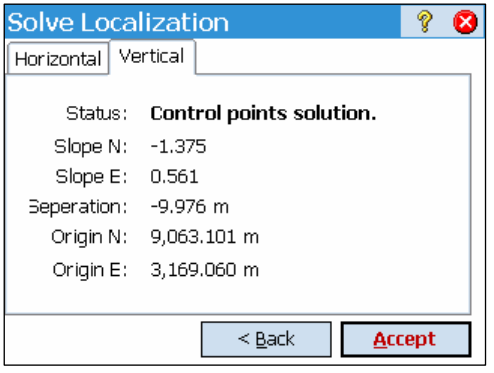
Rotation: displays the rotation.

Delta N / E: displays the horizontal shift from the centroid of the control points on the intermediate map projection to the centroid of the control points in the local coordinate system.

Origin N / E: displays the coordinate origin of the localization control points. This is the centroid of the control points on the intermediate map projection.

Vertical Card

The Vertical card shows results of the vertical localization solution.



Status: displays the status of the current vertical solution. This will be one of the following:

- Control points solution: is displayed when the parameters were calculated from the selected control points.
- Current vertical site: is displayed when there is a vertical solution and Solve V was not selected on this pass.
- Unadjusted geoid model: is displayed when there is a geoid model selected but no vertical adjustment.
- No vertical site: is displayed when there is no vertical solution and Solve V was not selected on this pass.

Slope N: displays the slope of the inclined plane along the local north grid axis in parts per million.

Slope E: displays the slope of the inclined plane along the local east grid axis in parts per million.

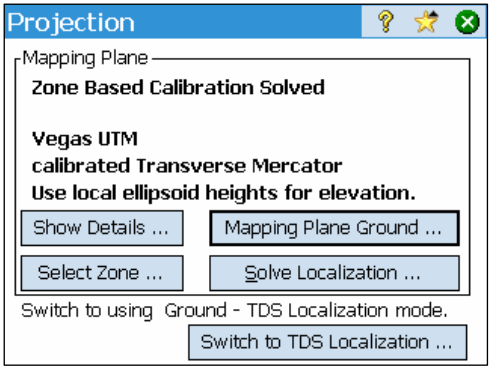
Separation: displays the separation between the inclined plane and the local elevation.

Origin N / E: displays the origin of the inclined plane. This is in local coordinates, and it will be the local coordinate of the first control point used in the solution (or your manual input location).

Accept: opens the Adjust with Projection wizard, where the latest coordinate system adjustment will be applied to your job file points, and you can review the results. When you accept the results, the coordinate system is updated in the job, the raw data is written, and the projection adjustment is applied to job points.

Projection – Mapping Plane Mode

The Projection screen is described below for when the horizontal projection mode is set to Mapping Plane.



Use this setting when you want your coordinate system to be a conformal map projection chosen from the coordinate system database file.

See Page R-206 for when the projection mode is set to TDS Localization.

Status Line: The text at the top of the screen describes the status of the horizontal projection solution.

Show Details...: opens the Projection Details screen, where the complete details of the localization solution, reference map projection, and Geoid model are displayed.

Select Zone...: opens the Select Coordinate System screen (Page R-226), where you can choose a zone or site from the data base, key in a custom zone, and delete zones or sites from the database.

Mapping Plane Ground...: opens the Ground Coordinates screen (Page R-226), where the grid to ground conversion parameters can be calculated and applied.

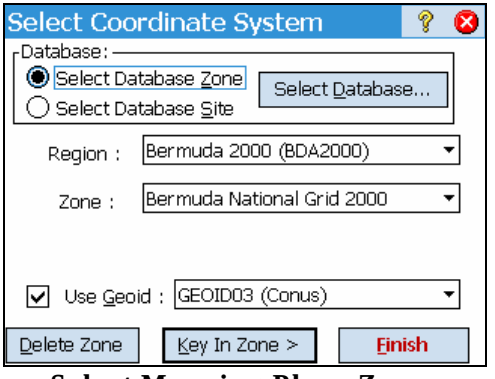
Solve Localization...: opens the Solve Localization wizard (Page R-210), where control points can be selected and the horizontal and vertical localization are solved.

Switch to TDS Localization...: switches the horizontal projection mode from Mapping Plane mode to Ground TDS Localization mode (Page R-206).

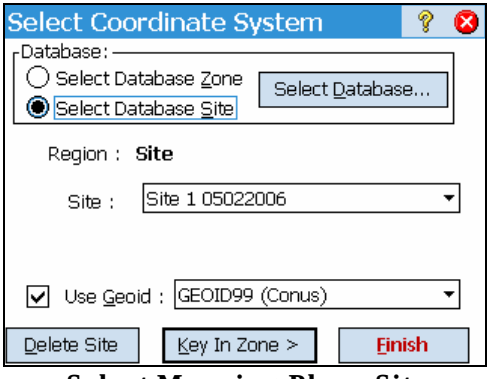
Select Coordinate System

Survey | Projection | Select Zone...

The Select Coordinate System screen is used to choose a mapping plane zone or localized site from the coordinate system database file. You can also open the Key In Zone wizard to create a new zone and datum with user specified parameters.



Select Mapping Plane Zone



Select Mapping Plane Site

Database: is where you select what type of coordinate system record to choose. You can:

- Use Database Zone: will display controls to pick a map projection from the regions and zones in the database.
- Use Database Site: will display controls to pick a localized zone based site from the Site region in the database.

Region: is where you select the region of the map projection zone.

Zone: is where you select the specific map projection zone.

Datum: is where you view or select the horizontal datum for this zone.

Note: Some zones in the database may not have a default datum attached. In this case, the datum control is a list box and you must select from the data base datums before you can set the zone.

Use Geoid: is where you choose to use a geoid model with this zone. You can pick a geoid model from the database using the drop down box.

Select Database: opens the Select Database screen where you select the coordinate system database to use.

Delete Zone: Deletes the currently selected site or zone.

Note: This delete function cannot be undone. Also, you cannot delete system database records. If you select a protected record, you will be prompted that the record cannot be deleted.

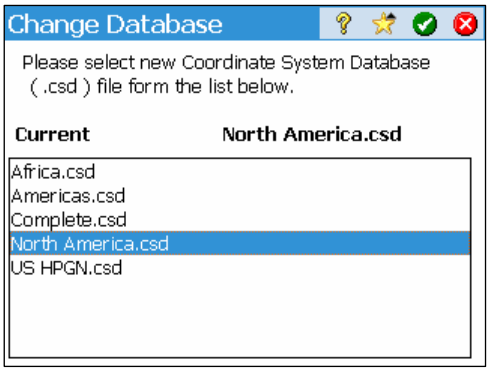
Key In Zone > opens the Key In Zone screen where you can create a custom map projection zone, ellipsoid and datum.

Finish accepts the currently selected zone and opens the Adjust with Projection wizard. After the preview of the adjustment results, the new coordinate system is set and the raw data is written.

Select Database

Survey | Projection | Select Zone... | Select Database...

The Select Database screen is used to select the coordinate system database to use. This screen will list all of the coordinate system database files (*.csd) you have in the Survey Pro application.

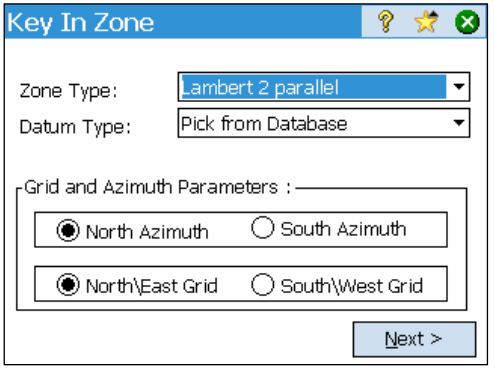


Key in Zone

Survey | Projection | Select Zone... | Key in Zone >

Key In Zone - Setup

The Key In Zone Setup screen is used to pick the zone and datum type for the new zone, as well as set the azimuth orientation and grid direction for the new zone.



Zone Type: is where you select what kind of map projection to use for the new zone. You can choose:

- Transverse Mercator.
- Lambert 1 Parallel
- Lambert 2 Parallel
- Stereographic / Oblique Stereographic
- Oblique Mercator Angle

Datum Type: is where you select what kind of datum to use for the new zone. You can choose:

- Pick from database. Choose this option to add a data base datum and ellipsoid to the new zone
- Custom Molodensky. Choose this option to use a custom 3-parameter datum transformation, with either a custom ellipsoid or a data base ellipsoid.
- Custom Similarity. Choose this option to use a 7-parameter datum transformation, with either a custom ellipsoid or a data base ellipsoid.

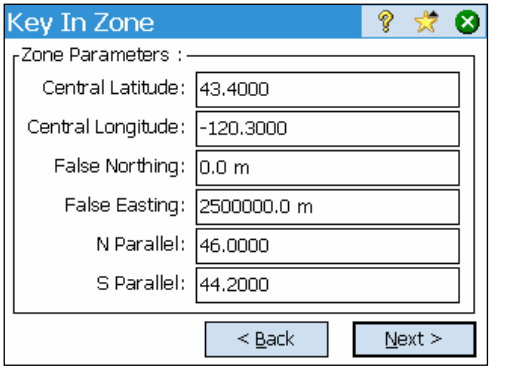
Grid and Azimuth Parameters: is where you select the grid azimuth and the positive coordinate direction.

- North Azimuth: is where you set a north azimuth for your new zone.
- South Azimuth: is where you set a south azimuth for your new zone.

- North/East Grid: is where you set the coordinates increasing positive in the north, east direction
- South/West Grid: is where you set the coordinates increasing positive in the south, west direction.

Key In Zone - Mapping Plane Parameters

The Key In Zone Mapping Plane Parameters screen is used to enter the values for the map projection zone.

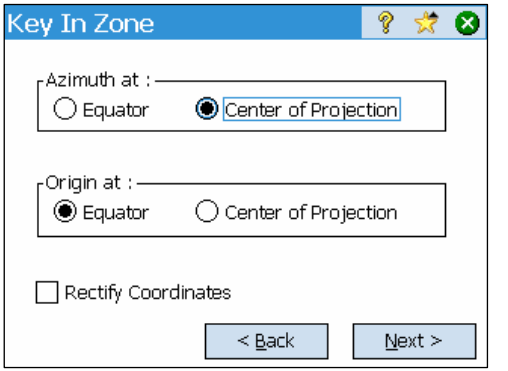


The parameters required depend on the zone type. They will include:

- Central Longitude / Latitude: is where you enter the geodetic origin of the map projection.
- False Northing / Easting: is where you enter the coordinate offsets at the origin of the map projection.
- Scale factor: is where enter the scale factor of the map projection.
- N / S Parallel: is where you enter the north and south standard parallels of the map projection.
- Azimuth: is where you enter azimuth of the central line of the map projection.

Key In Zone – Oblique Mercator Settings

The Key In Zone Oblique Mercator screen is sued to set extra parameters when the Zone Type is set to Oblique Mercator Angle.



Azimuth At: is where you enter the convention for projection azimuth. Your choices are:

- Equator
- Center of Projection

Origin At: is where you enter the convention for projection azimuth.

- Equator

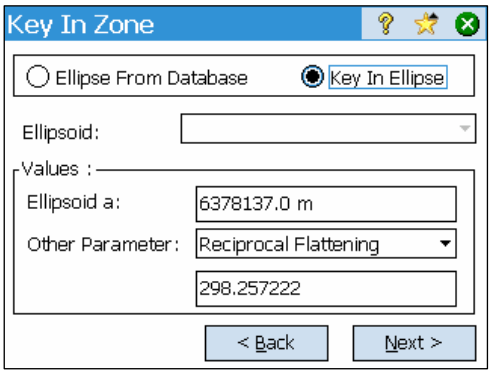
- Center of Projection

Rectify Coordinates: is where you set if the coordinates are rectified. Coordinates are 'rectified' if the local plane is rotated by the azimuth angle of the central meridian of the projection so that grid North lines up with geodetic north at the origin.

Key In Zone - Ellipse

The Key In Zone Ellipse screen is used to set or create an ellipse for a new datum. This screen is only displayed when Datum Type is Molodensky or Similarity.

Choose an ellipse for the new zone.



Ellipse from Data Base: Choose this option to use the selected data base ellipsoid.

Key in Ellipse: Choose this option to enter the values for the custom ellipsoid.

Values: is where you enter the values for the custom ellipse if you are not using Ellipse from List:

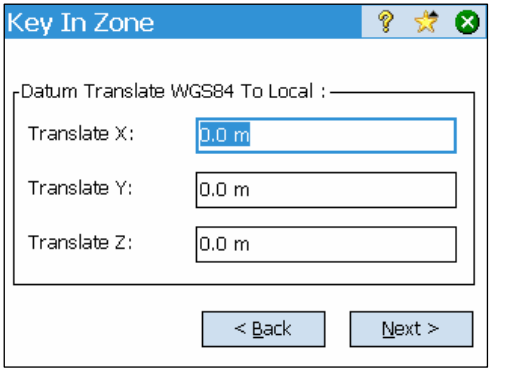
Ellipse a: is where you enter the semi major axis of the new ellipsoid.

Other Parameter: is where you select the other ellipse parameter to enter. You can use one of: Semi minor axis; Flattening; Reciprocal flattening; First eccentricity; First eccentricity squared; Second eccentricity; Second eccentricity squared.

Key In Zone - Datum Translation

The Key In Zone Datum Translation screen is used to enter translations when the Datum Type is Molodensky or Similarity.

Datum Translate From WGS84 To Local: is where you enter the three translations from WGS84 to the local datum.



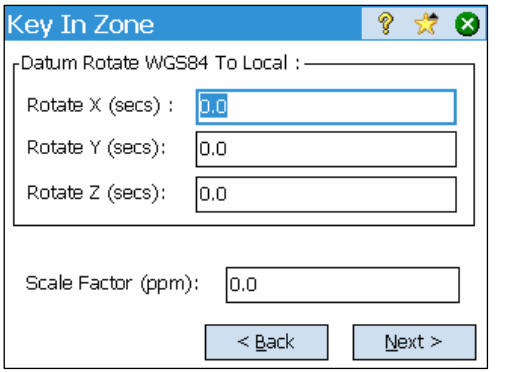
Note: The sign convention for the datum translations is from WGS84 to the local datum. If your datum transformation is defined for local to WGS84, be sure to inverse values before entering in Survey Pro.

Key In Zone - Datum Rotation and Scale

The Key In Zone Datum Rotation and Scale screen is used to enter translations when the Datum Type is or Similarity.

Datum Rotations From WGS84 To Local: is where you enter the three rotations from WGS84 to the local datum.

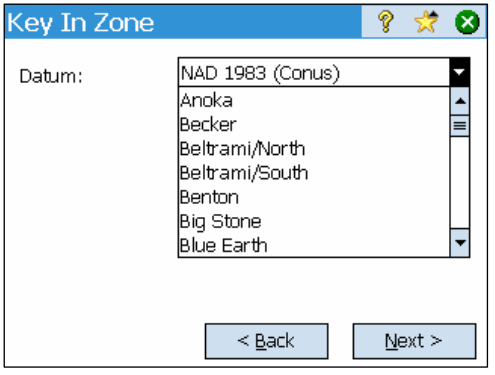
Scale Factor (ppm): is where you enter the scale of the datum transformation from WGS84 to the local datum. The scale factor is entered in parts per million.



Note: The sign convention for the datum rotations and scale factor is from WGS84 to the local datum. If your datum transformation is defined for local to WGS84, be sure to inverse the values before entering in Survey Pro.

Key In Zone - Datum from Database

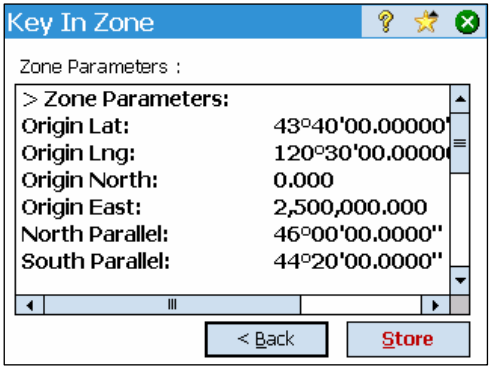
The Key In Zone Datum from Database screen is used to select a database datum when the Datum Type is Pick from Data Base.



Datum: is where you select the data base datum to use for the new zone.

Key In Zone - Results

The Key In Zone Results screen is used to review the values you input for the zone to be created.

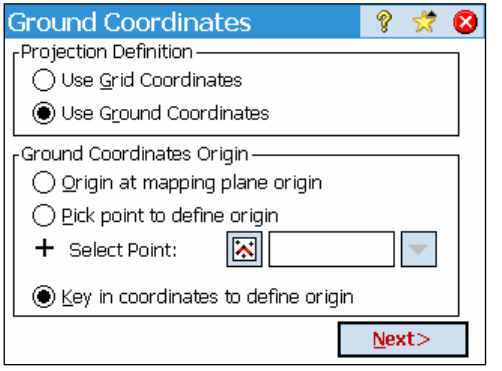


Store: opens a prompt to enter the region and zone of the new map projection zone, stores the named zone in the data base and sets the zone as the current projection record.

Ground Coordinates

Survey | Projection | Mapping Plane Ground...

The Ground Coordinates screen is used to toggle between grid and ground coordinates, and to select how to define the origin of the ground coordinate system.



Projection Definition: is where you choose how to represent the mapping plane coordinates. There are two options:

- Use Grid Coordinates: WGS84 geodetic coordinates will be transformed into mapping plane zone coordinates. Horizontal distances on the ground are usually scaled to the grid.
- Use Ground Coordinates: WGS84 geodetic coordinates will be transformed into ground scaled coordinates translated to a local origin. Horizontal distances on the ground are 1:1 on the grid, because the grid is scaled to the ground.

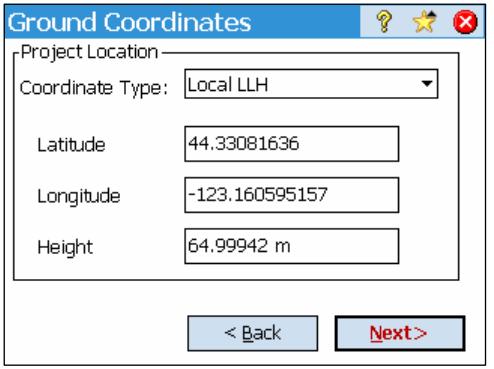
Ground Coordinates Origin: is where you select what point to use as the origin of the ground coordinate system relative to the origin of the mapping plane zone. You can choose to.

- Origin at mapping plane origin: ground coordinate scale factor will be applied from the origin of the mapping plane zone.
- Pick point to define origin: ground coordinate scale factor will be applied from a point selected from the job.
- Key in coordinates to define origin: ground coordinate scale factor will be applied from a location entered by the user.

Ground Coordinates - Key In Origin

Survey | Projection | Mapping Plane Ground... | Next >

The Ground Coordinates Key In Origin screen is used to input the location of the ground coordinates origin. This screen is used when you select Key in coordinates to define origin on the Setup screen.



Project Location: is where you enter the local point from which the ground coordinate scale factor is to be applied.

Coordinate Type: is where you select the type of coordinates to enter. You can use WGS84 geodetic, local geodetic, or grid coordinates. This choice will affect the fields displayed below.

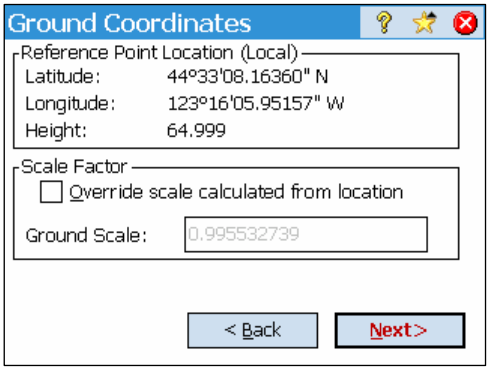
North/Latitude: is where you enter the northing / latitude of the local origin.

East/Longitude: is where you enter the easting / longitude of the local origin.

Elevation/Height: is where you enter the vertical coordinate of the local origin.

Ground Coordinates - Scale

The Ground Coordinates Scale screen is used to compute the scale factor to convert grid to ground coordinates for the reference height. This screen is used when you select either Key in coordinates to define origin or Pick point to define origin on the first page.



Reference Point Location (Local): displays the local Latitude, Longitude, and Height of the ground origin point.

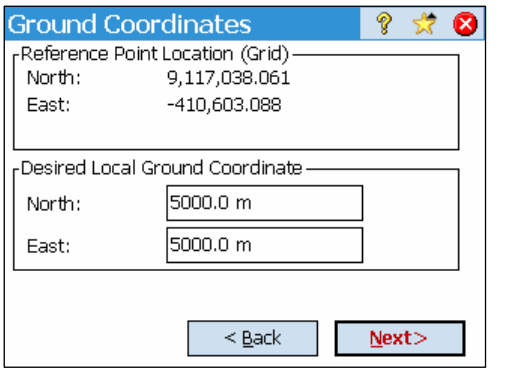
Scale Factor: displays the inverse combined scale factor for this ground setup. This scale factor is automatically calculated based on the local ground origin.

Override scale factor: is where you can over ride the scale factor. Check this control to

enable the scale factor edit field and enter any other scale factor.

Ground Coordinates - Location

The Ground Coordinates Location screen is used to define the local ground coordinate of the origin point. This coordinate will be used to calculate an offset from the mapping plane grid coordinates so that you can separate the grid and ground coordinates to make them recognizable. This screen is used when you select either Key in coordinates to define origin or Pick point to define origin on the first page.

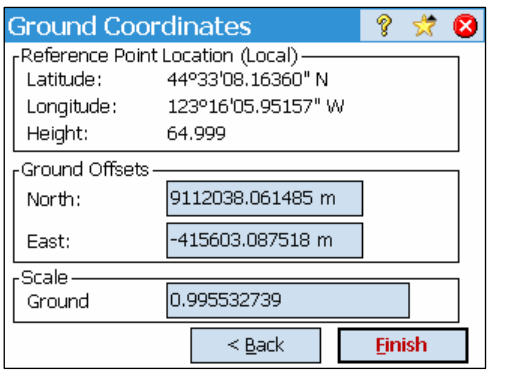


Reference Point Location (Grid): displays the local northing and easting of the ground origin.

Desired Local Ground Coordinate: is the desired local northing and easting coordinate of the ground origin.

Ground Coordinates - Results

The Ground Coordinates Results screen is used to preview the values to be used for the ground coordinate system. This screen displays the parameters for the ground coordinate system. If the origin was set to use either Key in coordinates to define origin or Pick point to define origin on the first page, the values on this page are calculated from the parameters entered in the wizard. If the origin was set at the Mapping plane origin, then you need to enter the scale and offsets in the edit fields on this page.



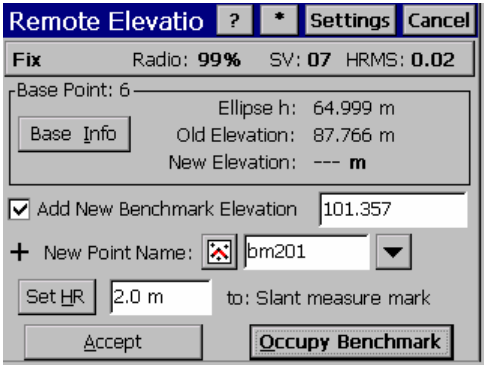
Ground Offsets: displays the shift applied to the mapping plane coordinates to get the desired local ground coordinate at the selected origin.

Scale: displays the ground scale factor.

Remote Elevation

Survey | Remote Elevation

The Remote Elevation screen is used to compute and store a new base point elevation and vertical site by occupying a known vertical benchmark at the rover.



Note: The Remote Elevation screen is only available when a geoid model is used for the vertical projection, the horizontal projection is already solved and the base and rover are set.

Base Point: displays the current base point number and elevation details.

Info: opens detailed information about the base point.

Add Benchmark Elevation: when checked, a new point will be created in the job file with the entered elevation. We will calculate (N,E) from the GPS measurement(lat,lng) and store the new point with the entered Elevation.

Elevation: When Add Benchmark Elevation is checked, this is the elevation of the new point.

Select Point / **New Point**: is the existing or new benchmark point name that you will occupy.

Set HR: displays the current antenna measurement and measure to setting. You can change the antenna measurement by entering a new value in the edit box. This new antenna height will be sent to the receiver with your next data collection point. You can change both the antenna measurement and measure to setting by tapping on Set HR to open the Receiver Antenna screen (Page R-184).

Accept: Updates the projection with the vertical solution calculated from the control point observation and opens the Adjust with

Projection wizard to update all job file points, including the base point, with the latest vertical solution.

Occupy Benchmark: opens the Occupy Control Point screen (Page R-197) where the measurement is taken by the rover on the remote benchmark. The New Elevation field of the Remote Elevation screen will then display the calculated elevation for the base point to be set on tapping Accept.

Import GPS Control

Survey | Import GPS Control

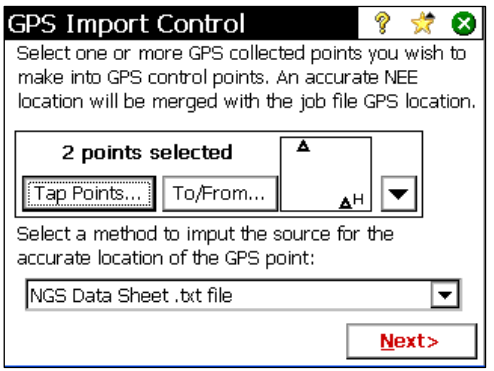
The Import GPS Control wizard is used to merge an accurate NEE location (control point source) with a GPS collected point in the job file. This point will then be designated as a GPS control point and can be used to solve a localization adjustment. Solving the localization adjustment can be done automatically at the end of this wizard, manually after the end of this wizard, or at a later time. There are three methods to import the control point source:

- Import from a text format 'OPUS Solution Report' email
- Import from a text format 'NGS Datasheet' file
- Key in a coordinate in NEE, LLH WGS84, or LLH local

Select Points and Import Source

The first screen is used to select the job points you want to merge with accurate NEE coordinates to convert to GPS control and select how you will enter the control point source to get the accurate NEE.

To/From...: opens the Select Point(s) screen where you can select points by specifying a point range.


GPS Import Control
Select one or more GPS collected points you wish to make into GPS control points. An accurate NEE location will be merged with the job file GPS location.
2 points selected
Tap Points...
To/From...
ΔH
Select a method to imput the source for the accurate location of the GPS point:
NGS Data Sheet .txt file
Next>

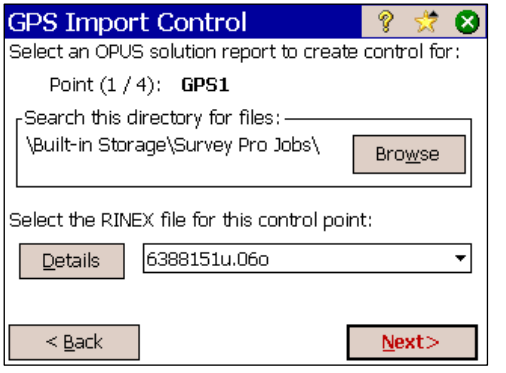
Tap Points...: opens a map view where you can select points by tapping them on the screen.

Select a method...: Is used to select from the following sources for accurate coordinates.

- OPUS Solution Results .txt file
- NGS Data Sheet .txt file
- Key In Coordinate

Next >: Opens one of two possible screens depending on the choice made for the Select a Method... field in the first screen.

Enter Control Coordinate – OPUS or NGS Data Sheet


GPS Import Control
Select an OPUS solution report to create control for:
Point (1 / 4): GPS1
Search this directory for files:
\Built-in Storage\Survey Pro Jobs\
Browse
Select the RINEX file for this control point:
Details
6388151u.06o
< Back
Next>

The purpose of this screen is to pick a data sheet point or OPUS solution file to use as the control point source. This is the second screen that appears when either OPUS Solution or NGS Data Sheet was selected in the first screen.

Point: displays the name of the selected job point that the control point source will be merged into.

Search this directory…: displays the path to look for OPUS or NGS txt files

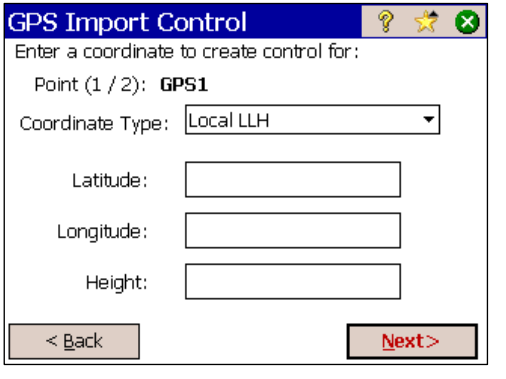
Browse: opens a new screen where you can select a different path to search for OPUS or NGS txt files. On , all .txt files in the specified directory are read and any valid data sheet points that are within 100 meters are then put into the drop-down list below.

Select the RINEX file, or NGS data sheet point…: Allows you to select any valid data sheet point found from the drop-down list.

Details: opens a screen that lists the selected OPUS Solution Report or NGS data sheet point details.

Next >: Opens the final screen.

Enter Control Coordinate – Key In



The purpose of this screen is to manually input the control point coordinates. This is the second screen that appears when Key In Coordinate was selected in the first screen.

Point (n / x): displays the name of the selected job point that the control point source will be merged into. A counter is included where n is the number of points set so far, including the one you are working on, and x is the number of total points to set in this sequence.

Coordinate Type: is where you select the type of coordinates being entered (Grid, Local LLH, or WGS84 LLH). The selection made here determines the format for the following three fields.

Latitude / North: The Latitude / Northing of the control point source.

Longitude / East: The Longitude / Easting of the control point source.

Height / Elevation: The Height / Elevation of the control point source.

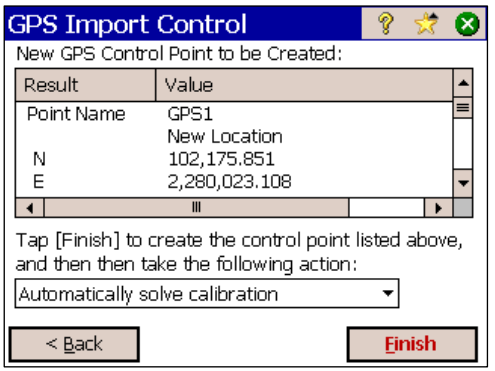
Next >: Re-starts the wizard if more control points need to be set, or opens the final screen if all control points are set.

Review Results and Finish

The final screen of the wizard shows a preview of the control point coordinates to be created. If there is only one point selected, the Single Point Results page will open. If there are multiple points selected, the Multiple Points Results page will be open.

Single Point Results

This page displays the values to be used to create the new GPS control point.



New GPS Control Point to be Created: This shows the new NEE location for the selected point, the existing LLH location, the existing NEE location, and the deltas between the new and old locations. This will also include data sheet details if the control point source comes from an NGS data sheet or an OPUS Solution Report file.

Tap [Finish] to…: determines what will occur after tapping Finish from the following options:

- Automatically solve localization / calibration
- Open the solve localization/calibration wizard
- Solve the localization/calibration later

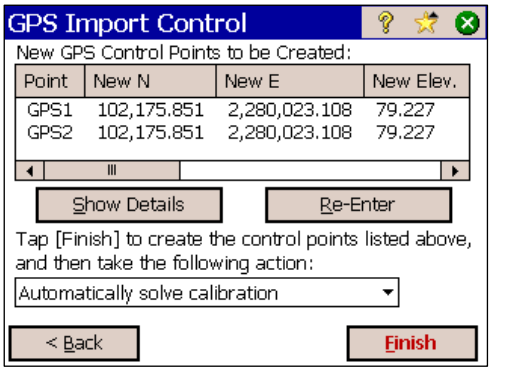
< Back: This opens a prompt asking if you want to reenter the control source for the selected point. If Yes, the control point source is

cleared for the point and the previous screen is open. If No, we leave the control point source and go back to the selection screen.

Finish: See the section on Finish below.

Multiple Point Results

This screen displays the values to be used to create the new GPS control points.



New GPS Control Points to be Created: For all of the selected points, this list box shows the new NEE location, the existing LLH location, and the existing NEE location.

Show Details: Shows the same details for the selected point as the Single Point Results screen shows, described above.

Re-Enter: Clears the control point source for the selected point in the list box and returns to the previous screen.

< Back: Returns to the selection screen.

Finish: See the section on Finish below.

Finish

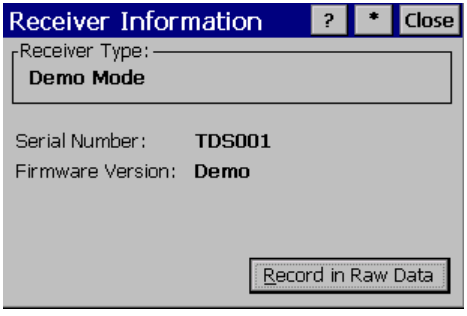
The finish behavior will be one of three cases:

1. Create the control points, solve the localization with all job file control points, launch the projection readjust wizard and apply the updated localization to the map projection zone.
2. Create the control points and open the solve localization wizard.
3. Create the GPS control points and exit the wizard.

Receiver Information

Survey | Receiver Info

The Receiver Information screen is used to display the serial number and firmware version of the current receiver. Also, different receivers will return additional information in this window including channel or option version installed.



Receiver Type: displays the manufacturer of the receiver currently connected to the data collector.

Serial Number: displays the serial number of the current receiver.

Firmware Version: displays the firmware version of the current receiver.

Note: the remaining fields, if any, are dependent on the particular make and model of the current receiver.

Record in Raw Data: records a note to the raw data file containing the information displayed on the screen.

Adjust with Projection

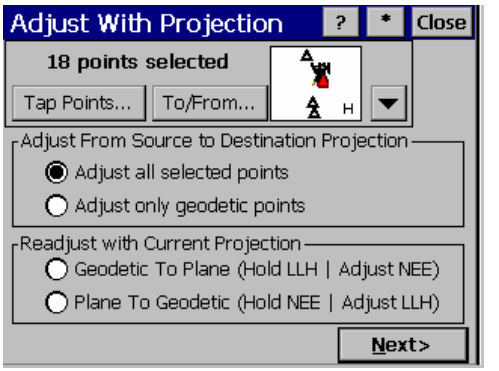
Survey | Adjust with Proj.

The Adjust with Projection wizard is used in three different cases. It is automatically opened to update job file points any time you change the coordinate system site, such as solving a localization adjustment or switching from grid to ground. It is automatically opened to provide the option of updating job file points any time you change the coordinate system definition, such as selecting a new mapping plane zone or switching horizontal projection modes. Finally, it can be opened by the user from the Survey menu to select and update points with a projection adjustment.

The screens displayed will vary depending on the action that opened the Adjust with Projection wizard. All of the screens are described below.

Adjust with Projection – Select Points

The Adjust with Projection Select Points screen is used to select points to be adjusted, and how to adjust them. This screen is only shown when the wizard is opened from the menu.



To/From...: opens the Select Point(s) screen where you can select points by specifying a point range.

Tap Points...: opens a map view where you can select points by tapping them on the screen.

There are two adjustment modes:

Source to Destination Projection: use this mode when you want to adjust locations in one coordinate system into locations in another coordinate system. You can choose the source and destination coordinate systems from the database. This mode has two options:

- **Adjust all selected points**: all eligible points will be adjusted. Points with plane only locations will be transformed into a

temporary WGS84 geodetic location using the source coordinate system, and then into a new plane location using the destination coordinate system. Points with a geodetic location will be transformed into a new plane location using the destination coordinate system.

- **Adjust only geodetic points**: only points with geodetic locations will be adjusted. All eligible points with geodetic locations will be transformed into a new plane location using the destination coordinate system.

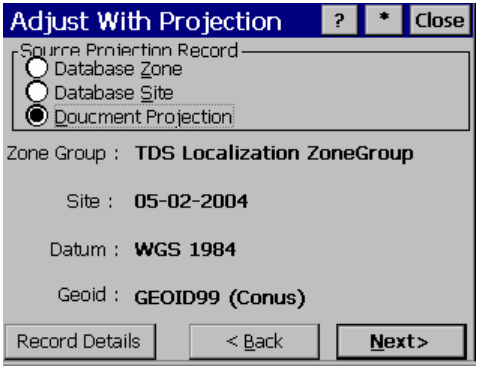
Readjust with Current Projection: use this mode when you want to readjust locations using the current coordinate system. This mode has two options:

- **Geodetic to Plane (Hold LLH | Adjust NEE)**: use this option to adjust the plane location of selected points with a geodetic coordinate. The plane location of selected points with a geodetic location will be recalculated using the current coordinate system set in the job.

Plane to Geodetic (Hold NEE | Adjust LLH): use this option to adjust or add geodetic locations to all points. The plane coordinate of all points will be used to calculate geodetic coordinates using the latest projection. Points that have geodetic coordinates will be updated, points that did not have geodetic coordinates will be set with the latitude, longitude, and height calculated from the transformation.

Adjust with Projection – Select Source Coordinate System

The Adjust with Projection Select Source Coordinate System screen is used to select the coordinate system of the current job file points. When the adjustment mode is Readjust with Current Projection, this screen shows the current coordinate system record details. This screen only shows when the wizard is opened from the menu.



The Select Source Coordinate System screen is almost identical to the Select Coordinate System screen described in the mapping plane section (Page R-209). The following controls are special to the Adjust with Projection wizard.

Source Projection Record: is where you select what type of coordinate system record to choose for the source. You can:

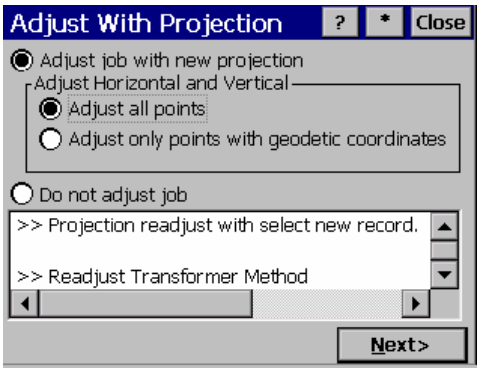
- **Database Zone**: will display controls to pick a map projection from the regions and zones in the database.
- **Database Site**: will display controls to pick a localized site record from either the Site region or the TDS Localization ZoneGroup group.
- **Current Projection**: will disable the edit boxes and display the current projection details. The job file coordinate system record will be used

Adjust with Projection – Select Destination Coordinate System

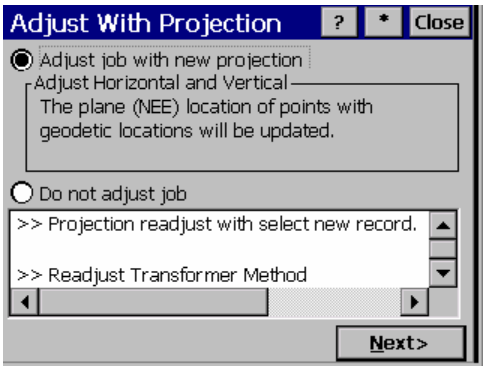
The Adjust with Projection Select Destination Coordinate System screen is used to select the coordinate system to transform the job file points into. The interface is identical to the Select Source Coordinate System screen described above. This screen only shows when the adjustment mode is set to Adjust From Source to Destination.

Adjust with Projection – Prompt Adjust

The Adjust with Projection Prompt Adjust screen is used to describe the difference between the source and destination record, and to prompt you whether or not you wish to adjust the job with the change of projection. This screen only shows when the wizard is opened because of a change of projection record.



Prompt choose points



Prompt geodetic points only

Adjust job with new projection:
is where you choose to adjust the job file points with the change of coordinate system.

Adjust Horizontal and/or Vertical: is where you choose how to update the horizontal and vertical coordinates in the job. There are two choices:

Adjust All Points: use this setting when you want to adjust all points. The method used to adjust plane and geodetic points is described on the Select Points page.

> **Adjust only points with geodetic coordinates**: use this setting when you want to update only geodetic points. The method used to adjust geodetic points is described on the Select Points page.

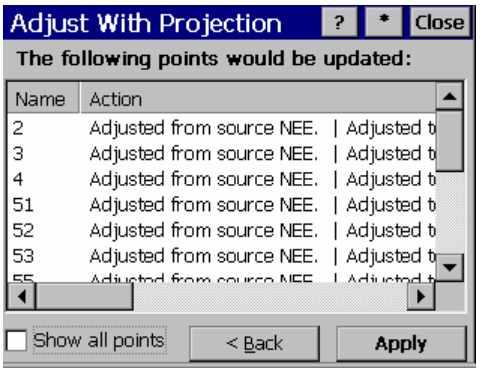
Note: The display of these controls will vary depending on the difference between the old and new coordinate system. First, if you change the coordinate system in only one dimension, the display title will indicate which dimension the setting is for. Second, depending on how you change the coordinate system, the option to adjust all or geodetic only may or may not be available. If the choice is not available, you will see some text describing which points will be adjusted. Third, if you change both dimensions, and only one dimension would allow this choice to be active, then the display title will indicate which dimension the setting is for.

Do Not Adjust Job: is where you choose to not adjust the job points with this change of coordinate system.

Details: displays a description of the change between the two coordinate system records.

Adjust with Projection – Results

The Adjust with Projection Results screen is used to preview the results of the adjustment before it is applied to the job file points.


Adjust With Projection
?
*
Close
The following points would be updated:
Name
Action
2 Adjusted from source NEE. | Adjusted t
3 Adjusted from source NEE. | Adjusted t
4 Adjusted from source NEE. | Adjusted t
51 Adjusted from source NEE. | Adjusted t
52 Adjusted from source NEE. | Adjusted t
53 Adjusted from source NEE. | Adjusted t
Show all points
< Back
Apply

Show All Points: when checked, the results list will show all points selected for the adjustment, including points that are not adjusted or which did not change location with the adjustment. When not checked, the results list will show only those points that will change as a result of this adjustment, or points that did not change because of a projection error.

Apply: applies the adjustment to the listed points.

Note: When the Adjust with Projection wizard was opened from the menu, tapping Apply will only update the selected job file point locations. The job file coordinate system will not be changed in this case. When the Adjust with Projection wizard was opened automatically as a result of a change of coordinate system, tapping Apply will update all eligible job file point locations, and it will update the job file coordinate system.

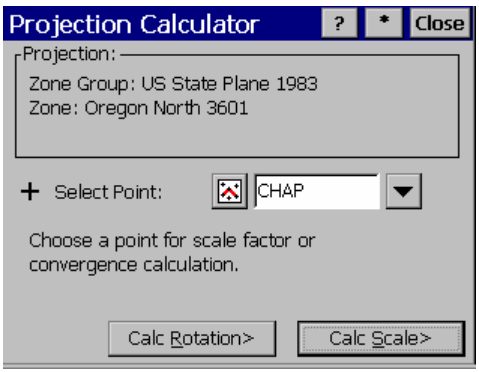
Adjust with Projection – Adjust More

The Adjust with Projection Adjust More screen is used to return to the Select Points screen if you wish to adjust some selected points again. This screen only shows when the wizard was opened from the menu.

Projection Calculator

Survey | Projection Calc.

The Projection Calculator wizard is used to calculate scale factor or convergence (rotation) for any point on the selected mapping plane. You can use the computed values for calculations from the, Past Results power button option.



Projection: displays the current mapping plane settings.

Select Point: is where you enter the name of the reference point where the rotation or scale is to be computed.

Calc Rotation >: opens the Projection Calculator screen where the rotation is computed.

Calc Scale >: opens the Projection Calculator screen where the scale is computed.

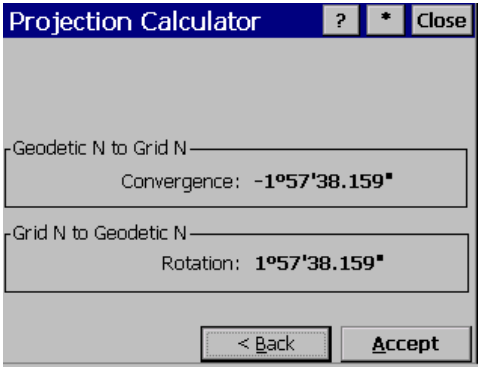
Projection Calculator – Rotation

Convergence: displays the computed rotation from geodetic north to grid north.

Rotation: displays the computed rotation from grid north to geodetic north.

< Back: returns you to the first Projection Calculator screen.

Accept: copies the two computed values to past results and returns you to the first Projection Calculator screen.

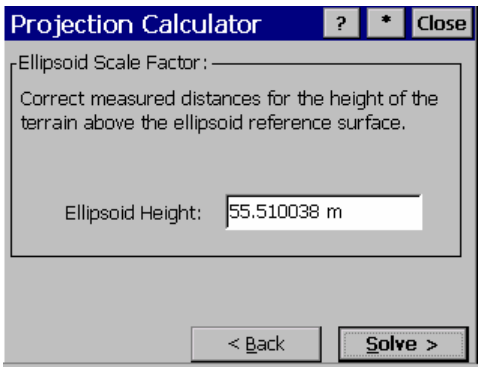


Projection Calculator – Scale – Height Correction

Ellipsoid Height: is where you enter the WGS84 ellipsoid height for your current location. This value will be used to calculate the height above the terrain component of the scale factor. This is sometimes referred to as the sea level correction.

< Back: returns you to the first Projection Calculator screen.

Solve >: takes you to the final screen.

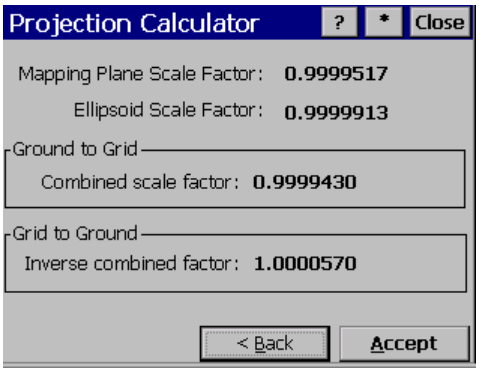


Projection Calculator – Scale

Mapping Plane Scale Factor: displays the computed mapping plane scale factor on the selected mapping plane at the reference point.

Ellipsoid Scale Factor: displays the computed ellipsoid scale factor at the reference point.

Combined Scale Factor: displays the Mapping Plane Scale Factor multiplied by the Ellipsoid Scale Factor. This is the ground to grid scale factor.



Inverse Combined Factor: displays the inverse of the Combined Scale Factor. This is the grid to ground scale factor and is the value used in the localization solution.

< Back: returns you to the previous Projection Calculator screen.

Accept: copies the two computed values to past results and returns you to the Main Menu.

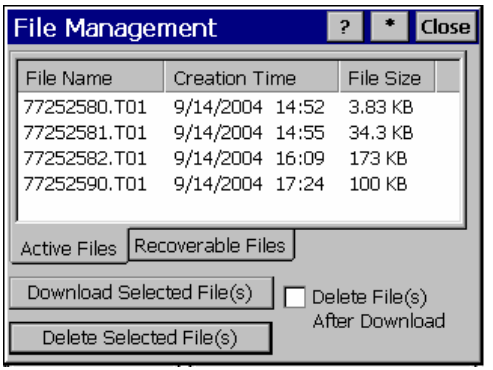
File Management

Survey | File Management

The File Management routine is used to manage post processing files on a supported GPS receiver. The routine can delete post processing files from the receiver or recover files that were recently deleted. Post processing files can also be copied or moved from the receiver to the data collector for more convenient transfers to a PC.

Active Files

The Active Files page lists the details of all the post processing files that are currently on the receiver. Files can be selected from this list to delete or copy/move to the data collector.



Delete Selected File(s): Deletes the selected files from the receiver.

Note: When files are deleted from the receiver, they are actually renamed so that they can be recovered later. The oldest renamed files will automatically be permanently deleted by the receiver when disk space becomes low.

Download Selected File(s): copies the selected files to the data collector. These files will be stored in the directory on the data collector where the current job resides.

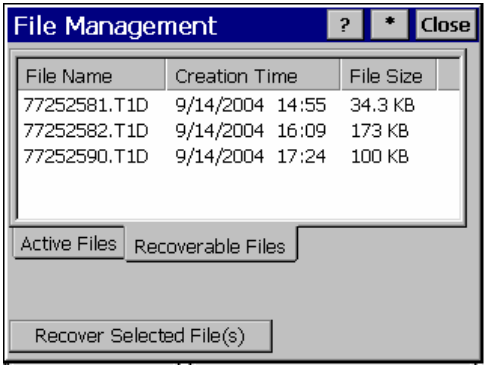
Note: If a file being downloaded already exists on the data collector, you can overwrite the existing file, give the downloaded file a new name, or cancel the transfer. If you choose to give the file a new name, you must also provide the same *.T00 or *.T01 extension as in the original name.

Note: Downloaded files can be transferred to a PC with ActiveSync and then converted to a *.DAT file for use with Trimble Geomatics Office (TGO). To convert a *.T00 or *.T01 file to a *.DAT file, right-click on the file from a PC running the latest version of TGO and select Convert to DAT format.

Delete File(s) After Download: When checked, any files that are copied to the data collector will automatically be deleted from the receiver after the transfer.

Recoverable Files

The Recoverable Files page lists the details of all the files on the receiver that were recently deleted. Files can be selected from this list and recovered.



Recover Selected File(s): Restores the selected files on the receiver.

Survey Menu – Basic GPS

The Survey Menu while running in GPS mode with the Basic GPS module contains the routines used for RTK data collection and post processing data collection. The menu items are the same regardless of the type of data collection. However, some functions, such as Control Points and Remote Elevation will only allow you to start when connected to an RTK receiver. The Data Collection function will behave differently based on the receiver type that is active. Page references are given for screens that are already described for the GPS module.

A: GPS Status

B: Start GPS Survey

C: Data Collection

D: Control Points

E: Post Processing

F: Projection

G: Receiver Info

H: File Management

GPS Status

Survey | GPS Status

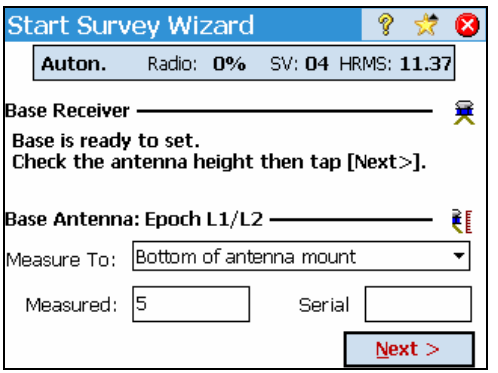
The GPS Status screens are described starting on Page 172.

Start GPS Survey

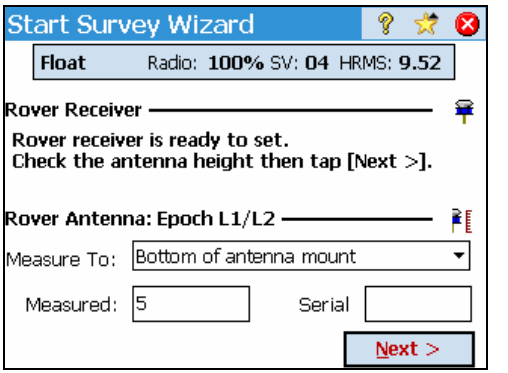
Survey | Start GPS Survey

The Start GPS Survey wizard is used to complete the setup necessary for any RTK GPS Survey. It is opened from the main menu, or any time you try to access data collection or stake out functions. The steps to complete the Start GPS Survey wizard will depend on what you have already done in the job.

When connecting to the receivers by serial cable, Survey Pro will detect if it is a base or rover and start the workflow accordingly. When connecting to either receiver by Bluetooth, you are prompted for which receiver you are connected to. Each screen is shown below.



Connected to Base


Start Survey Wizard
Float Radio: 100% SV: 04 HRMS: 9.52
Rover Receiver
Rover receiver is ready to set.
Check the antenna height then tap [Next >].
Rover Antenna: Epoch L1/L2
Measure To: Bottom of antenna mount
Measured: 5
Serial
Next >

Connected to Rover

Base/Rover Receiver: displays information about the status of the receiver.

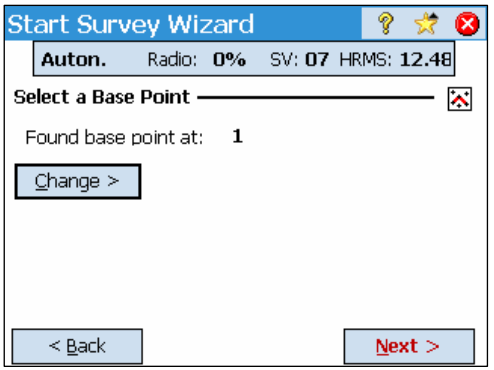
Measured To: specifies the location on the antenna or receiver where the antenna height should be measured to.

Measured: The distance from the ground to the Measured To location.

Serial #: is the serial number of the antenna. This information is optional and written as a note in the raw data.

Next >: opens the next screen, which depends on the type of receiver you are connected to and at what stage in the Start GPS Survey routine you are at.

Start Survey – One Matching Base Point



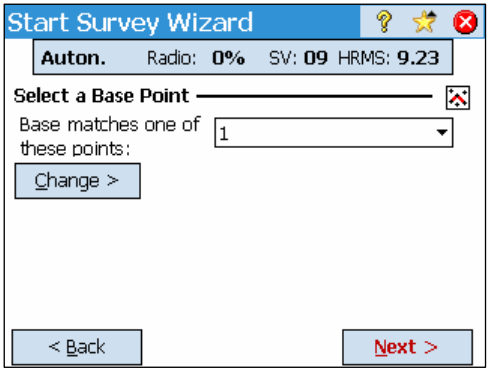
This screen will open when the base is set up on a point that potentially matches only one point in the job.

Change >: opens the Start Survey – No Matching Base screen (Page R-248) where the base point can be redefined before continuing.

Next >: opens the Set Up Rover screen.

Start Survey – More than One Matching Base Point

This screen will open when the base is set up on a point that potentially matches more than one point in the job.



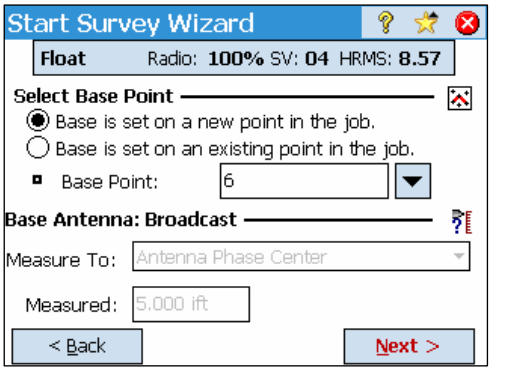
Change >: opens the Start Survey – No Matching Base screen (Page R-248) where the base point can be redefined before continuing.

Select a Base Point: allows you to choose a point from the dropdown list, which contains all the matching points found in the job.

Next >: opens the Set Up Rover screen.

Start Survey – No Matching Base Point

This screen will open when the base is set up on a point that does not match any point in the job.

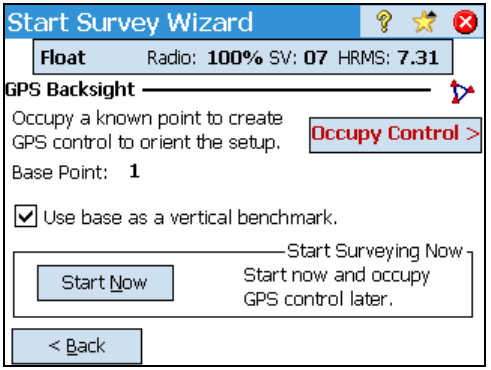


Base is set on a new job point: Select this if the base is set up on a point that is not already stored in the job. The next screen will then require that you connect to the rover receiver and occupy control points to perform a resection for the base position.

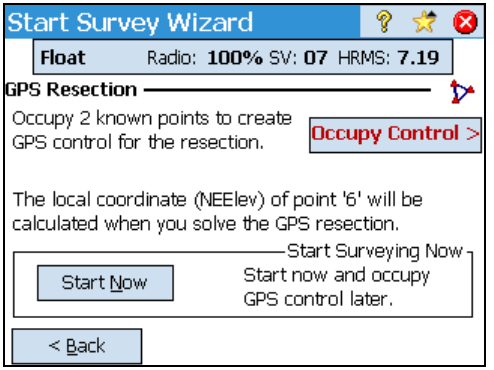
Base is set on an existing job point: Select this when the base is set up on a point stored in the job.

Base Point: specifies the name of the base point. This is a new point name when the base is set on a new point or an existing point name when the base is set on an existing job point.

GPS Backsight/Resection


Start Survey Wizard
Float Radio: 100% SV: 07 HRMS: 7.31
GPS Backsight
Occupy a known point to create GPS control to orient the setup.
Occupy Control >
Base Point: 1
Use base as a vertical benchmark.
Start Surveying Now
Start Now
Start now and occupy GPS control later.
< Back

GPS Backsight


Start Survey Wizard
Float Radio: 100% SV: 07 HRMS: 7.19
GPS Resection
Occupy 2 known points to create GPS control for the resection.
Occupy Control >
The local coordinate (NEElev) of point '6' will be calculated when you solve the GPS resection.
Start Surveying Now
Start Now
Start now and occupy GPS control later.
< Back

GPS Resection

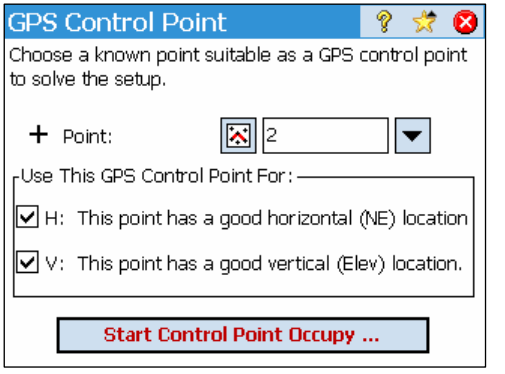
The GPS Backsight/Resection screen will open any time the coordinate system is not solved. It will have one of two states depending on if the base was set up on an existing job point and one additional control point is needed to orient the setup, or the base was set up on a new point from an autonomous setup.

Occupy Control > : opens the Occupy Control Setup screen, described below.

Use base as vertical benchmark: Check this box if the base is set up on a job point with an accurate elevation to include it for vertical control during localization.

Start Now : opens the Data Collection screen without collecting GPS control at this time.

Occupy Control Setup


GPS Control Point
Choose a known point suitable as a GPS control point to solve the setup.
Point:
2
Use This GPS Control Point For:
H: This point has a good horizontal (NE) location
V: This point has a good vertical (Elev) location.
Start Control Point Occupy ...

The Occupy Control Setup screen is used to specify which job point with accurate NEE coordinates you are occupying and if you want to use the point for horizontal and/or vertical control when localizing (this can be changed later).

Point: is the existing job point you are occupying.

H: Check this if the point has good horizontal coordinates to use for horizontal control when localizing.

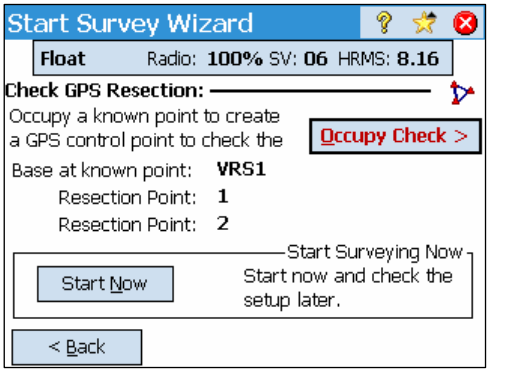
V: Check this if the point has a good elevation to use for vertical control when localizing.

Start Control Point Occupy: Opens the Occupy Control Point screen, described on Page R-255.

Occupy Control Point

The Occupy Control Point screen is used to add geodetic coordinates to an existing project point and is described on Page R-255.

Resection for New Base Point

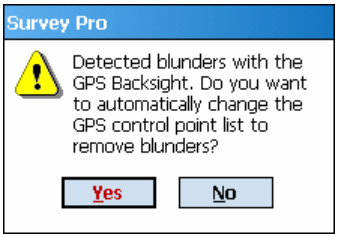

Start Survey Wizard
Float Radio: 100% SV: 06 HRMS: 8.16
Check GPS Resection:
Occupy a known point to create a GPS control point to check the
Occupy Check >
Base at known point: VRS1
Resection Point: 1
Resection Point: 2
Start Surveying Now
Start Now
Start now and check the setup later.
< Back

Occupy Check >: opens the Collect Check Point Prompt screen to select an existing job file point and initiate an occupation to check the localization solved with the minimum amount, and then create an extra GPS control point, which will be used to re-solve the localization and run the blunder detection routine.

Start Now >: starts surveying without checking the localization. In this case, the localization solved with the minimum control

points will be set in the job file, and the projection readjust mechanism will run to update any job points as required. You must remember that the solution has not been checked for quality.

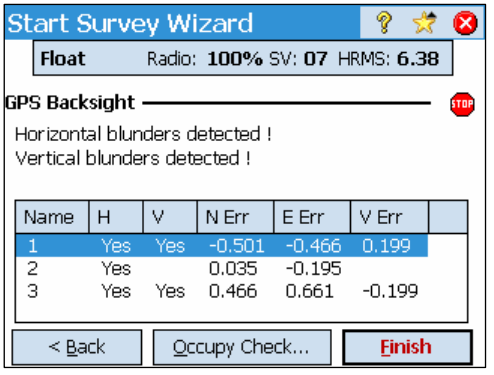
Solve Localization


Survey Pro
Detected blunders with the GPS Backsight. Do you want to automatically change the GPS control point list to remove blunders?
Yes
No

Before the Solve Localization wizard starts, the localization is computed using all the control points, and then the automatic blunder detection routine runs to detect low quality control points. Tapping Yes at this prompt will automatically disable the horizontal and/or vertical control that results in a poor solution. This can be overridden in the next screen.

The Solve Localization wizard is used to solve a horizontal and vertical adjustment for a coordinate system. The user interface and procedure to solve a localization in Ground – TDS Localization mode and Mapping Plane mode are very similar.

Solve Localization – Residuals


Start Survey Wizard
Float Radio: 100% SV: 07 HRMS: 6.38
GPS Backsight
Horizontal blunders detected !
Vertical blunders detected !
Name H V N Err E Err V Err
1 Yes Yes -0.501 -0.466 0.199
2 Yes 0.035 -0.195
3 Yes Yes 0.466 0.661 -0.199
< Back
Occupy Check...
Finish

The Solve Localization Residuals screen is used to display the residuals from the least squares solution, and to change your control point selections and re-solve the adjustment if desired.

If Yes is displayed in the H or V column, it indicates the corresponding control point will be included in the horizontal or vertical localization solution, respectively. These can be toggled between Yes (included) or blank (not included) by tapping them. If the blunder detector detected any poor quality control, it will automatically turn off that control before this screen opens.

The possible outcomes of the solve localization and blunder detection are:

- **Green Light**: If the localization solved and no blunders were detected, you will see a green light and the status line will

show the root mean squared (RMS) error of the horizontal and vertical solution.

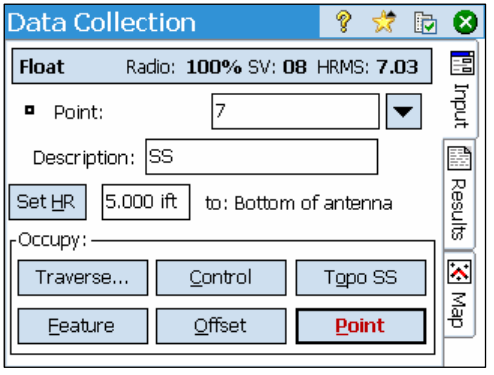
- **Yellow Warning Triangle**: If the localization solved and no blunders were detected, but some of the points used have a large residual error, you will see a yellow triangle and the status line will show the point with the largest horizontal and/or vertical residual.
- **Red Stop Sign**: If the localization solved, and blunders were detected that could not be clearly identified, or if you were prompted to remove blunders and you said no, then you will see a red stop sign and the status line will indicate there are possible blunders in the solution.
- **Yellow Arrow**: If the localization solved, but the control points are not spaced far enough apart to run the automatic blunder detection, then you will see a yellow arrow, and the status line will indicate the poor geometry of the control points, or if the localization fails to solve, you will see a yellow arrow and the status the status line will indicate the failure to solve the localization.

Finish: will solve the localization. If any of the horizontal or vertical control toggles are changed in this screen before tapping Finish, the button will change to Resolve, allowing you to re-compute the quality before continuing.

Occupy Additional Check Point: opens the Occupy Control screen (Page R-255), which allows you to collect another control point and add it to the localization solution.

Data Collection

Survey | Data Collection



The Data Collection screen is used to collect GPS measurements and store new points in the job.

GPS Status (at top of screen): displays the current solution type, the data modem reception quality, the number of satellites used and the horizontal precision computed by the receiver. When this area is tapped, the GPS Status screen will open (Page R-172).

Point: is where you enter the point name for the next point to be stored.

Desc: is where you enter the description for the next point to be stored.

Set HR: displays the current antenna measurement and measure to setting. You can change the antenna measurement by entering a new value in the edit box. This new antenna height will be sent to the receiver with your next data collection point. You can change both the antenna measurement and measure to setting by tapping on Set HR to open the Receiver Antenna screen (Page R-184).

Traverse: opens the Traverse Base screen, described below.

Control: opens the Control Points screen (Page R-195).

Topo SS: stores a point with a single epoch of data. The current position is checked against the criteria, and if acceptable, the point is stored.

Note: The Topo SS function never puts the receiver in static mode, so the precision of the rapid side shot will be less than a point occupied in static mode.

Feature: opens the Feature Collection screen (Page R-191), where various automatic and manual data collection options are available.

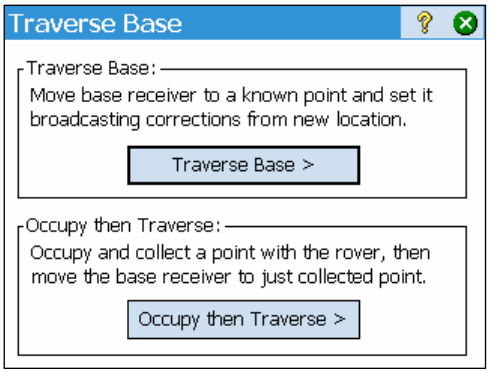
Offset: opens the Offset Shots screen (Page R-193), where a point can be collected and stored at a specified offset.

Point: opens the Occupy Data Points screen (Page R-194), used to occupy and store a new point.

Traverse Base

Survey Data Collection Traverse...

The Traverse Base routine provides an easy method to collect a point and then move your base to that point, or to move your base to any existing point in the current job.


Traverse Base
Traverse Base:
Move base receiver to a known point and set it broadcasting corrections from new location.
Traverse Base >
Occupy then Traverse:
Occupy and collect a point with the rover, then move the base receiver to just collected point.
Occupy then Traverse >

Traverse Base >: This prompts you to move your base to another existing job point and then starts the Start GPS Survey wizard, described on Page R-246.

Occupy then Traverse >: Opens the Occupy Data Points screen (Page R-194) and allows you to first occupy a new point and then move the base to that point before starting the Start GPS Survey wizard, described on Page R-246.

Control Points

Survey Control Points or

Data Collection Control

The Control Points screen is used to measure GPS control points to use in the localization adjustment, or to check the location of exiting points against GPS measurements and the latest coordinate system. This screen is described on Page R-195.

Check Control Point Screen

Survey | Control Points | Check Point or

Data Collection | Control | Check Point

The Check Control Point screen is used to check a control point. This is done when you want to verify the quality of the coordinate system solution and is described on Page R-196.

Occupy Control Point Screen

Survey | Control Points | Control or

Data Collection | Control | Control

The Occupy Control Point screen is used to add geodetic coordinates to a known project point. The most common use of this screen is to measure control points for the localization solution and is described on Page R-197.

Post Processing

Survey | Post Processing

Post processing data collection involves two steps. First, you must open a file and begin logging GPS raw data for post processing. Second, you must measure the antenna height and enter the antenna and station ID for each point you occupy. The Post Processing routine is described, starting on Page R-199.

Projection

Survey | Projection

The Projection Information screen is used to select and solve the horizontal and vertical projections, which are used to transform GPS measured WGS84 coordinates (latitude, longitude, height) into local coordinates (North,East,Elevation). The screen is also used to switch

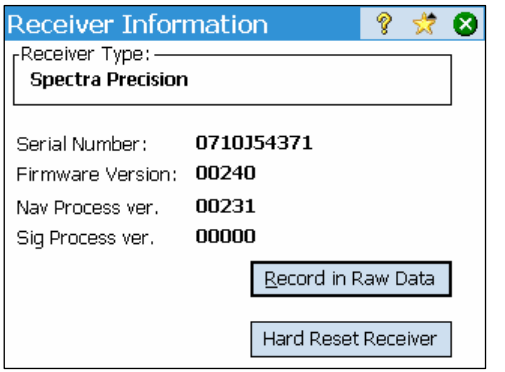
between mapping plane and localization mode. The buttons available will vary depending on the current projection mode.

This screen and the screens accessed from it are nearly the same as those found in the GPS module, which are described on Pages R-205 to R-228. The Solve Localization screens vary slightly and are described on Page 251.

Receiver Information

Survey | Receiver Info

The Receiver Information screen displays the serial number, firmware version and other information about the current receiver.



Serial Number: displays the serial number of the current receiver.

Firmware Version: displays the firmware version of the current receiver.

Record in Raw Data: records a note to the raw data file containing the information displayed on the screen.

Hard Reset Receiver: resets the receiver.

File Management

Survey | File Management

The File Management routine is used to manage post processing files on the GPS receiver. The routine can delete post processing files from the receiver or recover files that were recently deleted. The files can also be copied or moved from the receiver to the data collector for more convenient transfers to a PC. The routine is identical in the GPS module and is covered on Page R-243.

Leveling Menu

The Leveling Menu replaces the Survey Menu when running in leveling mode. It contains routines to perform a level loop or 2-peg test.

A: Select/Create Loop

B: Level

C: 2 Peg Test

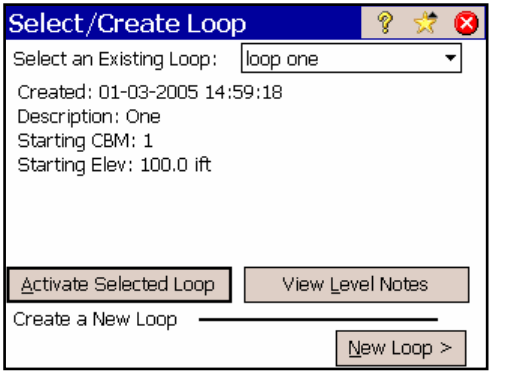
D: Adjustment

E: Remote Control

Select/Create Loop

Leveling | Select/Create Loop

The Select/Create Loop screen is used to select a loop that has not yet been closed, view the notes for any existing loop, or create a new level loop.



Select an Existing Loop: allows you to select an existing loop from the dropdown list.

Activate Selected Loop: opens the selected loop so new data can be added to it. (This button will not be available when a closed loop is selected.)

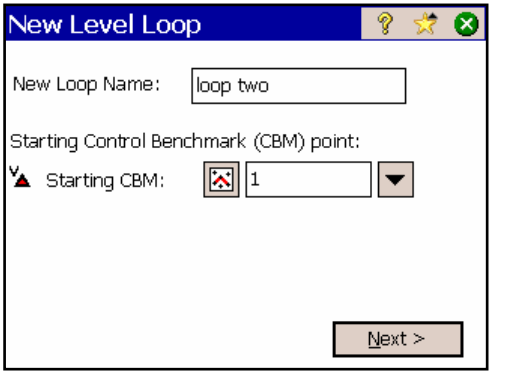
View Level Notes for Selected Loop: displays the notes for the selected loop in the Level Notes screen, described below.

New Loop >: opens the New Level Loop screen, described next, where a new loop can be created.

New Level Loop

Leveling | Select/Create Loop | New Loop >

The New Level Loop screen is used to create a new level loop.

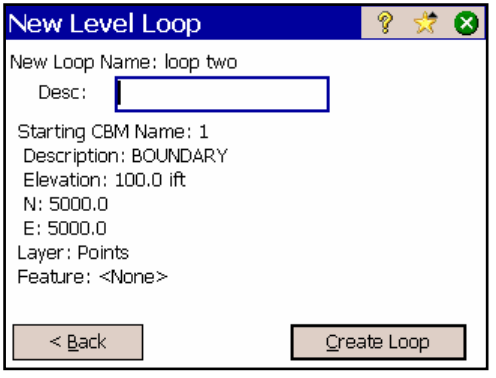


New Loop: is where you enter a name for the new loop.

CBM: is the starting benchmark. This point must exist in the current job.

Next >: opens the next screen.

New Level Loop – Screen Two



Desc: is where you can enter an optional description for the new loop.

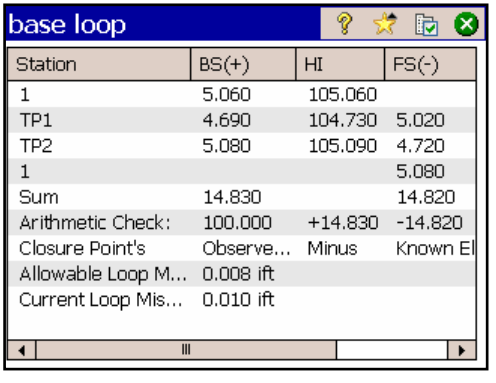
< Back: returns to the previous screen.

Create Loop: creates the new loop.

Level Notes

Leveling | Level | Notes

or Leveling | Select/Create Loop | View Level Notes for Selected Loop

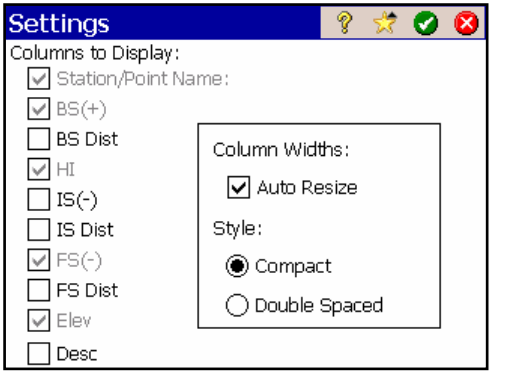


The Level Notes screen shows the details of every shot taken for the current loop. If the loop was closed, additional closure details are also provided.

The appearance of this screen can be customized by tapping the button to open the Level Notes Settings screen described below.

Level Notes Settings

Leveling | Level | Notes



The Level Notes Settings screen is used to customize what and how the information in the Level Notes screen is displayed.

☑ **Station/Point Name**: displays the Station column where the name of each point and the number of each turning point shot is listed. This column cannot be turned off.

☑ **BS(+)**: is the column that lists all the backsight readings. This column cannot be turned off.

☑ **BS Dist**: When checked, a column is displayed that lists the horizontal distances measured from the instrument to each backsight.

☑ **HI**: is the column that lists the elevations computed for the instrument at each setup. This column cannot be turned off.

☑ **IS(-)**: When checked, a column is displayed that lists the readings for all intermediate shots. (Intermediate shots include side shots and stakeout shots, which are not included as legs of the level loop.)

☑ **IS Dist**: When checked, a column is displayed that lists the horizontal distances measured from the instrument to each intermediate shot. (Intermediate shots include side shots and stakeout shots, which are not included as legs of the level loop.)

☑ **FS(-)**: is the column that lists all the foresight readings. This column cannot be turned off.

☑ **FS Dist**: When checked, a column is displayed that lists the horizontal distances measured from the instrument to each foresight.

☑ **Elev**: is the column that lists the elevation computed for every point shot. This column cannot be turned off.

☑ **Desc**: When checked, a column is displayed that lists the description for each point shot that exists in the current job. (Turning

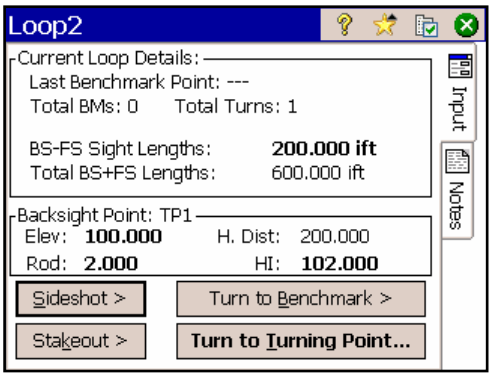
points are not stored in the job and therefore do not have descriptions.)

Column Width: When ☑ Auto Resize is checked, the column widths are automatically sized so the content of each column is visible.

Style: When set to ⊙ Compact, the backsight data for a particular setup is displayed on the same row as the foresight data from the previous setup. When set to ⊙ Double Spaced, the data for each backsight and foresight shot are displayed in separate rows.

Level

The Level screen provides information about the current level loop and is used to specify which of the four possible observation types to shoot next.



Current Loop Details: displays details about the current loop.

Backsight Point: displays details about the current backsight. Most of these details will only be available after shooting an intermediate shot (side shot or stakeout shot).

Sideshot >: opens the Sideshot screen (Page R-263) where the required information is entered to perform a side shot.

Stakeout >: opens the Stakeout screen (Page R-265) where the required information is entered to perform a stakeout shot.

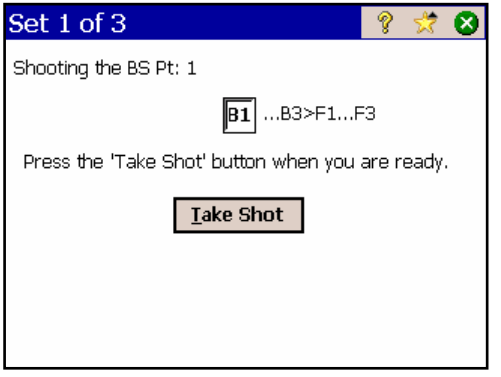
Turn to Benchmark >: opens the Benchmark screen (Page R-262) where the required information is entered to shoot either a closing or non-closing benchmark.

Turn to Turning Point...: Opens the Take Shot screen, described next, where you can immediately begin taking the necessary shots for a turning point.

Notes: displays all the notes for the current level loop.

Leveling Shots

Leveling | Level | Turn to Turning Point... (This screen is also accessed when taking shots for any other observation type.)



The Leveling Shots screen is used to perform the required shots to whichever observation you are shooting. The specific shots you are prompted for depends on the observation type, the number of sets, and the shooting sequence.

You will only be prompted to shoot a backsight while shooting the first observation from any given setup.

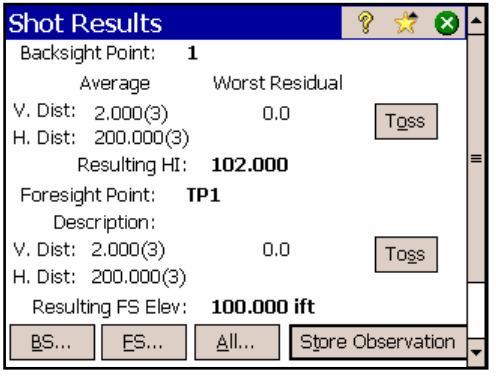
The top line indicates if you are shooting your backsight or foresight, and which point you are shooting in relation to the entire loop.

The box on the second line tells you which shot to take next. The term B1 means to shoot the backsight for Set 1. If the box showed F3, it would mean to shoot the foresight for Set 3, and so on.

Take Shot: takes the shot indicated within the box on this screen.

Leveling Shot Results

The Shot Results screen opens when you are finished taking the shot necessary shots for a particular observation.



Toss: will delete the shot data from the corresponding set of shots that has the worst residual. Each consecutive tap of this button will delete the next shot with the worst residual until all the sets are eventually deleted.

BS...: allows you to shoot additional shots to the backsight. You will be prompted to shoot the number of sets specified in the Level Settings screen.

FS...: allows you to shoot additional shots to the foresight. You will be prompted to shoot the number of sets specified in the Level Settings screen.

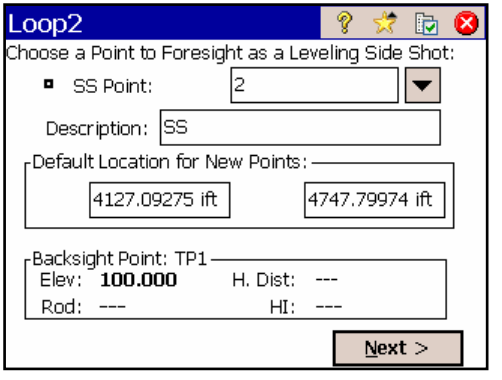
All...: allows you to shoot additional shots to the backsight and foresight. You will be prompted to shoot the number of sets in the shooting sequence specified in the Level Settings screen.

Store Observation: records the observation and returns you to the Level screen where you can specify which type of observation to shoot next.

Leveling Side Shot

Leveling | Level | Sideshot >

The Leveling Sideshot screen is used to describe a leveling side shot before taking the necessary shots to record it.



SS Point: is the name for the new point.

Desc: is an optional description for the new point.

Default Location for New Points: is where you specify the northing and easting to use when the new point is stored since the leveling procedure cannot compute these.

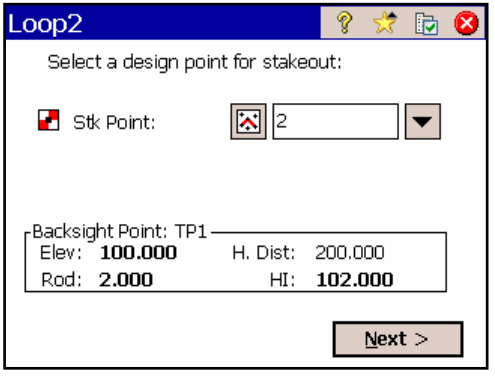
Backsight Point: Lists the details for the current backsight. If this is the first observation from the current set up, most of the details will be unknown.

Next >: opens the Take Shot screen (Page R-262) where the required shots are performed.

Leveling Stakeout

Leveling | Level | Stakeout >

The Leveling Stakeout screen is used to measure the elevation at an existing point and compute a cut/fill value.



Stk Point: is the point in the current job that you want to shoot to determine the cut/fill value. (The location for this point must be known in advance since the leveling routine cannot compute horizontal coordinates.)

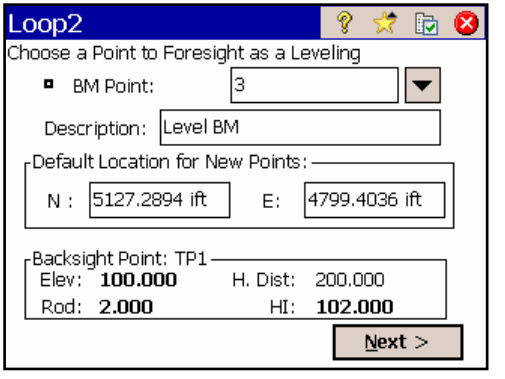
Backsight Point: Lists the details for the current backsight. If this is the first observation from the current set up, most of the details will be unknown.

Next >: opens the Take Shot screen (Page R-262) where the required shots are performed.

Turn to Benchmark

Leveling | Level | Turn to Benchmark

The Turn to Benchmark screen is used to take a shot at a known benchmark. When shooting a benchmark that will not be used as the closing benchmark, the procedure is identical to shooting a leveling side shot with the exception that this benchmark will be the backsight in the next setup.



BM Point: is the point name for the benchmark. This will usually be a new point when it is a non-closing benchmark and will usually be the same point as the starting benchmark when it is the closing benchmark.

Desc: is the optional description for the benchmark. This is not applicable when shooting the closing benchmark since the closing benchmark must already exist in the current job.

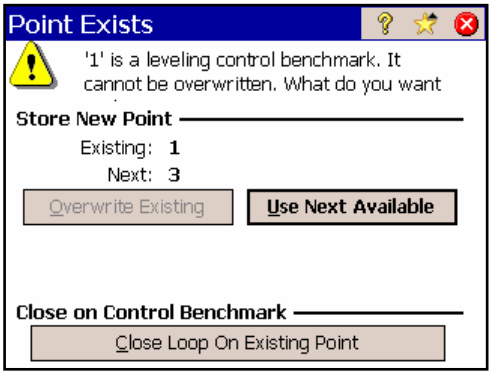
Default Location for New Points: is where you specify the northing and easting to use when shooting a new point. This is not applicable when shooting the closing benchmark.

Backsight Point: Lists the details for the current backsight. If this is the first observation from the current set up, most of the details will be unknown.

Next >: opens the Take Shot screen (Page R-262) where the required shots are performed. If the shots are taken to an existing point, such as when shooting the closing benchmark, the Point Exists screen, described next, will open where the loop can be closed.

Point Exists

The Point Exists screen will appear after shooting a benchmark that is already stored in the current job and is used to overwrite the point, create a new point, or access the Close Loop screen to close the loop.


Point Exists
'1' is a leveling control benchmark. It cannot be overwritten. What do you want
Store New Point
Existing: 1
Next: 3
Overwrite Existing
Use Next Available
Close on Control Benchmark
Close Loop On Existing Point

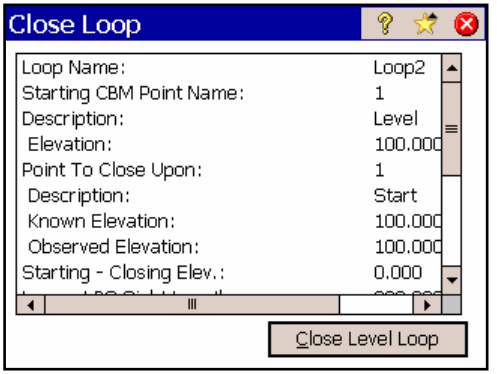
Overwrite: Allows you to overwrite the coordinates of the benchmark with the new coordinates. This option will not be available when the benchmark entered in the Turn to Benchmark screen was the same as the starting benchmark.

Use Next: allows you to create a new point using the coordinates entered in the Turn to Benchmark screen and the elevation measured from the previous shots. This option should not be selected when shooting the closing benchmark.

Close Loop By Existing Point: opens the Close Loop screen, described next.

Close Loop

The Close Loop screen lists the notes for the current level loop and allows you to close the current loop. This is the only screen that can be used to close a loop.

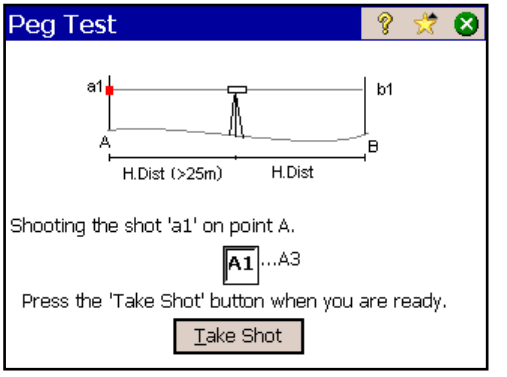


Close Level Loop: closes the current level loop and opens the Level screen where no additional shots can be taken.

2 Peg Test

Leveling | 2 Peg Test

The 2 Peg Test screen is used to check that the line of sight through the level is horizontal when the bubble is properly centered.



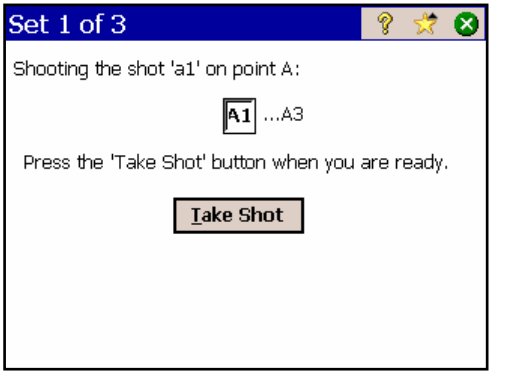
The graphic of this screen shows the current setup and indicates which shot you will be shooting next with a red square. The first line of text also indicates which shot must be taken next.

Check H. Dist: This button appears after shooting the initial shots to Point A. This will measure the horizontal distance to Point B and compare it with the distance already measured to Point A. Come/go information is then provided so the rod over Point B can be moved until it equals the horizontal distance to Point A. Use of this button is optional and the results are not used for computing the error.

Take Shot: takes the required sets of shots to the point indicated on this screen.

2 Peg Shots

Leveling | 2 Peg Test | Take Shot



The 2 Peg Shots screen is used to perform the required shots to whichever observation you are shooting. The specific shots you are prompted for depends on which rod you are shooting and the number of sets configured in the Level Settings screen.

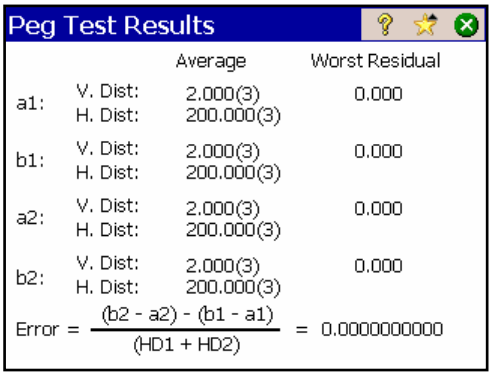
The top line indicates if you are shooting the rod over Point A or Point B, and if you are shooting the shots for the first or second setup.

The box on the second line tells you which shot

to take next. The term A1 means to shoot the rod over Point A for Set 1. If the box showed B3, it would mean to shoot the rod over Point B for Set 3.

Take Shot: takes the shot indicated within the box on this screen.

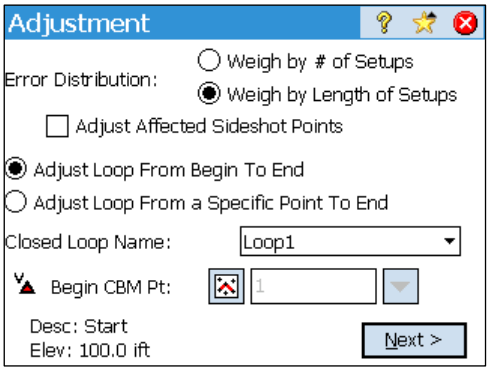
Peg Test Results



The Peg Test Results screen appears after all the required shots are performed for a peg test. The screen lists the details for all the shots taken and the computed error. All the shots taken and the error are recorded only in the raw data file.

Adjustment

Leveling | Adjustment



The Adjustment routine allows you to perform a simple arithmetic elevation error adjustment to an existing closed loop. You can choose to distribute the error equally to each setup, or apply a weighted adjustment proportional to the distance between each setup. You also have the option to adjust any side shots that were performed in the selected loop.

Weigh by # of Setups: This option divides the computed error equally among each setup selected in the loop.

Weigh by Length of Setups: This option distributes the error where each setup is adjusted by an error proportional to the length between

them, so setups that are farther apart will carry a larger portion of the error adjustment than the setups that are closer together.

Adjust Affected Sideshot Points: When checked, any side shots will be adjusted by the same amount as the setup that was occupied when the side shots were performed.

Adjust Loop From Begin To End: This option includes every setup of the selected level loop in the error adjustment.

Adjust Loop From a Specific Point To End: This option will only adjust the setups starting from an alternative benchmark specified in the Begin CBM Pt field to the end of the loop.

Closed Loop Name: is where you select the loop to adjust from the dropdown list. Only closed loops are available.

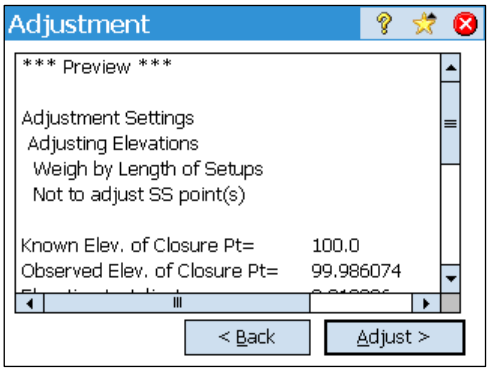
Begin CBM Pt: This item is only available when Adjust Loop From a Specific Point To End is selected above and allows you to select an alternative benchmark starting point in the loop for the adjustment. Any setups prior to the selected benchmark will not be adjusted. The description and elevation for the selected benchmark are displayed at the bottom of the screen.

Next >: opens the Adjustment Preview screen.

Adjustment – Preview Screen

The second adjustment screen allows you to preview the details of the adjustment before applying it.

< Back: Returns to the previous screen without applying the adjustment so changes can be made to the configuration.



Note: If you do not want to apply the adjustment and do not want to make changes to the configuration, simply tap to cancel and close the screen.

Adjust: Performs the adjustment and opens a screen that details the results.

Note: If the selected loop has already been adjusted or if the computed error is negligible, the Adjust button will be inactive.

Leveling Remote Control

Leveling | Remote Control

The Remote Control screen can only be accessed in leveling mode when trigonometric leveling with a robotic total station. The Remote Control screen is described on Page R-162.

All shots performed while trigonometric leveling with a robotic total station are performed from the Remote Control screen.

Stakeout Menu

The Stakeout Menu contains a variety of stakeout routines, including offset staking. See Page R-333 for a description of the Stakeout Menu if running in GPS mode.

A: Stake Points

B: Stake List of Points

C: Stake to Line

D: Offset Staking

E: Slope Staking

F: Point Slope Staking

G: Line and Offset

H: Curve and Offset

I: Spiral and Offset

J: Show Station (and Offset)

K: Store Offset Points

L: Stake DTM

M: Station Staking

N: Define a Location

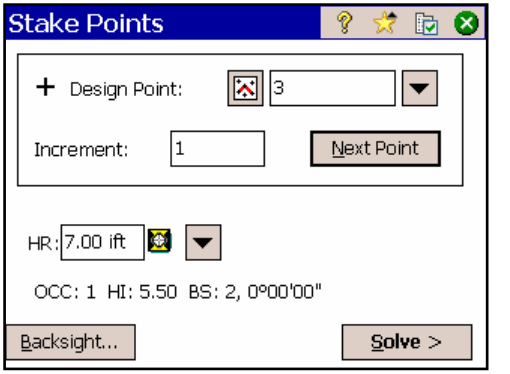
O: Where is Next Point

Note: The stakeout routines behave differently when running in remote control mode. For a description of this special mode, refer to Page R-162, and the Remote Control section of the User's Manual.

Stake Points

Stakeout | Stake Points

The Stake Points screen allows you to stake a single point or a series of points.



: opens the Stakeout Settings screen (Page R-47).

Design Point: is the name of the first point that you want to stake.

Increment: when advancing to the next point, the point number is incremented by the value entered here. (A negative integer can be entered to have point numbers advance in descending order.)

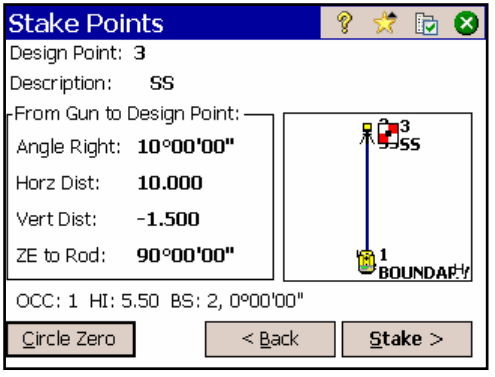
Next Point >: advances the current Design Point by the Increment value. If that point does not exist and the Increment value =1, the Design Point is advanced to the next existing point.

Height of Rod: is the length of the rod.

Backsight...: opens the Backsight Setup screen (Page R-118).

Solve >: takes you to the second Stake Points screen where the distance and direction to the design point is displayed, see below.

Stake Points – Screen Two



Design point: displays the name of the design point that was entered in the first screen.

Description: displays the description assigned to the design point.

Angle Right: is the horizontal angle to turn to face the design point.

Horz. distance: is the horizontal distance from the occupy point to the design point.

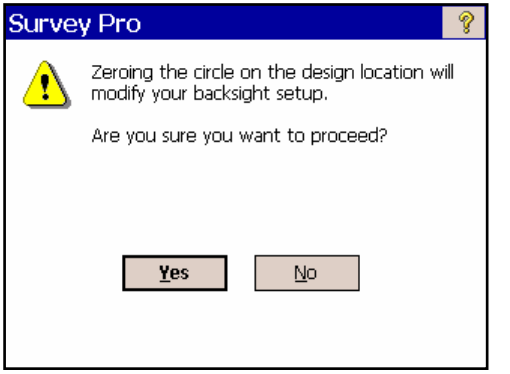
Vert Distance: is the vertical distance from the occupy point to the design point.

ZE to Rod: is the zenith angle required to face the prism over the design point.

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing toward the design point, which can sometimes be easier than turning to an obscure angle value. When this button is tapped, the following actions will occur:

1. A new backsight circle value is computed, sent to the instrument and stored in the raw data
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the design point.
3. To prevent errors, the backsight set up is invalidated when exiting the Stakeout dialog if this button has been used. A circle zeroed on a design point is meaningless once the design point has been staked.

4. The dialog shown here will be displayed the first time Circle Zero is used during a stakeout session to warn that the original backsight reference will be lost.

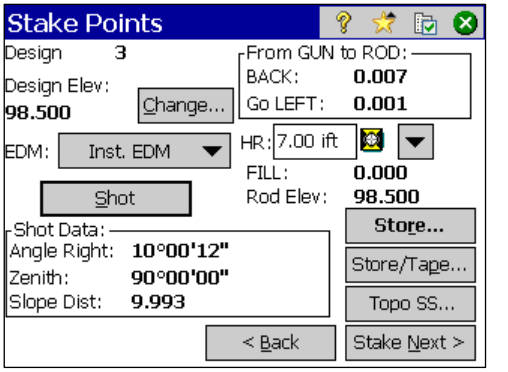

Survey Pro
Zeroing the circle on the design location will modify your backsight setup.
Are you sure you want to proceed?
Yes
No

Note: The Circle Zero button is not available when using a robotic total station.

< Back: returns to the first screen.

Stake >: opens the third and final Stake Points screen where the shots to the stake point are performed.

Stake Points – Screen Three



Height of Rod: is the length of the rod.

Design Elev: displays the current design elevation, which can be modified with the Change... button.

FORWARD / **BACK**: indicates if the rod must move forward (toward the total station) or backward (away from the total station).

Go RIGHT / **Go LEFT**: indicates if the rod must move to the right or left from the total station's point of view.

EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

CUT / **FILL**: displays the required amount of cut or fill to bring the stake point to the design point's elevation.

Rod Elev: displays the elevation at the rod's location computed from the last shot.

Change... : is used to modify the current design elevation, which will also modify the associated CUT/FILL value for the current station being staked.

Shot : takes a shot to the prism and computes come/go, cut/fill information.

Shot data: displays the measurements from the last shot.

Store... : stores the stake point.

Store/Tape... : opens the Stake Out Point (Tape Offset) dialog box (Page R-309), where the staked point can be stored that includes a specified offset. The default value is the appropriate distance correction to the design point.

Topo SS... : stores a side shot using the data from the last shot taken. (This will not take a new shot.)

Turn Gun : (available with robotic total station) turns the total station toward the design point.

< Back : returns to the second screen.

Stake Next > : returns you to the previous Stake Points screen where the Design point is advanced by the Increment value.

Instrument Stakeout

Stakeout | Stake Points | Solve > | Stake >

Instrument Stakeout is a special stakeout option only available when using a Nikon DTM or NPL series total station while the Send Stakeout Data to Instrument option is checked in the Instrument Settings screen.

When using Instrument Stakeout, a new stakeout screen, shown below, will appear after you tap Stake > from the Stake Points - Screen Two, described above. The stakeout data is then sent to the total station where the controls on the total station are used to stake the point.

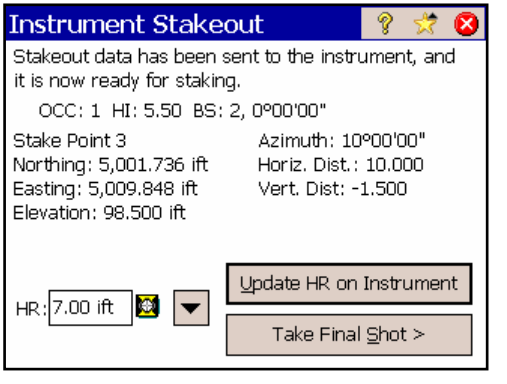
Once you are satisfied with the stake location, tap Take Final Shot > to shoot the final stakeout location and proceed to the Stake Points – Screen Three, as described above.

If you tap Shot from Screen Three to take another shot, you will return to the Instrument Stakeout screen, where you can once again use the controls on the total station to stake the point.

HR: is the rod height.

Update HR on Instrument: If a new rod height is entered in the HR field, or if a new Smart Target is selected, this button sends the new HR information to the total station.

Take Final Shot >: Once you are satisfied with the stake location, this button will take a final shot before proceeding to the next Stake Point screen (Screen Three, described above).

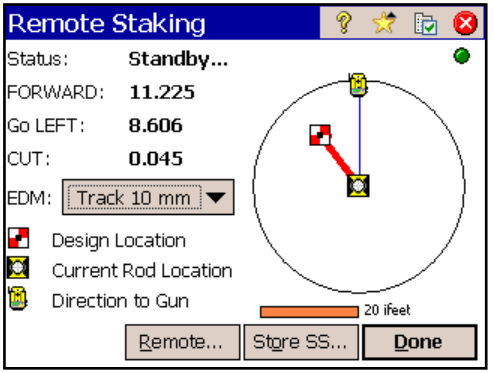

Instrument Stakeout
Stakeout data has been sent to the instrument, and it is now ready for staking.
OCC: 1 HI: 5.50 BS: 2, 0°00'00"
Stake Point 3
Northing: 5,001.736 ift
Easting: 5,009.848 ift
Elevation: 98.500 ift
Azimuth: 10°00'00"
Horiz. Dist.: 10.000
Vert. Dist: -1.500
HR: 7.00 ift
Update HR on Instrument
Take Final Shot >

Remote Staking

Stakeout | Stake Points | Solve > | Stake >

Performing stake out in remote mode is different from running in a non-remote mode because the feedback is continuous and provided in the rod's point of view instead of the total station's point of view.

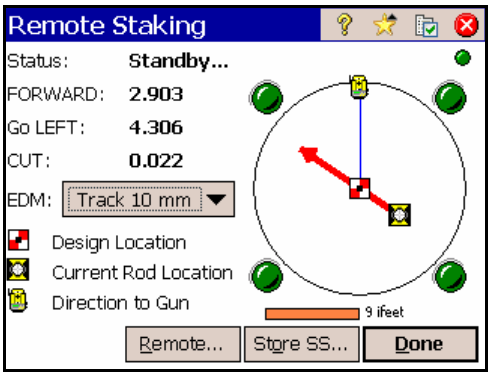
When staking in remote mode, the first four shots taken in a row where no distance is returned will result in a beep to warn that the instrument has possibly lost track of the prism.



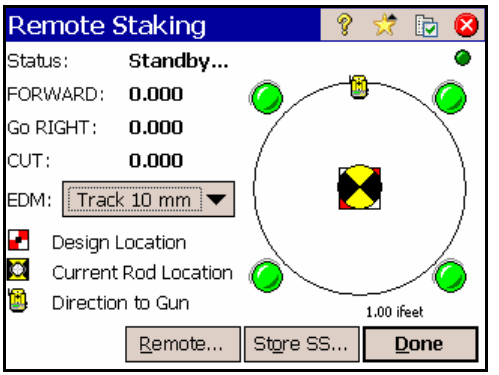
Display when prism is more than 3-meters from the target.

There are three different graphic displays of the Remote Staking screen, depending on how close the rod is to the stake point. Each screen is shown here.

Done: when you are satisfied with the location of the prism, this button will open the Stake Point screen (see Page R-274) where the staked point can be stored.



Display when prism is within 3 meters from the target.

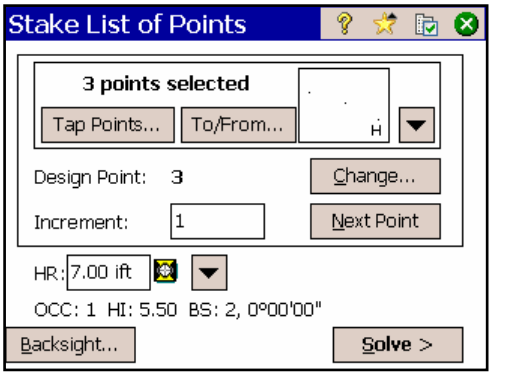


Display when the prism is within the Horizontal Distance Tolerance specified in the Stakeout Settings screen (Page R-47).

Stake List of Points Screen

Stakeout | Stake List of Points

The Stake List of Points screen is used to stake points from a specified list of points. Points can also be selected by description or polyline.



: opens the Stakeout Settings screen (Page R-47).

Tap Points...: displays a map of the current job. Simply tap the points that you want to stake and then tap ✔.

To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

▼: Allows you to select points using a variety of other methods including: select all points; all control points; all non-control points; by description; or by polyline.

Design Point: displays the point to be staked. The initial Design Point is the first point of the selected polyline or point range.

Change...: opens the Edit Point List screen where the current point list can be edited.

Increment: is the number of points to advance from the Design Point after tapping Next Point >. (A negative integer can be entered to have point numbers advance in descending order.)

Height of Rod: is the length of the rod.

Next Point >: Advances the Design Point by the Increment and automatically solves to open the Stake List of Points screen where you can begin staking the point. The points are advanced in the same order that they were defined when the polyline was created or when the point range was defined.

Backsight...: opens the Backsight Setup screen (Page R-118).

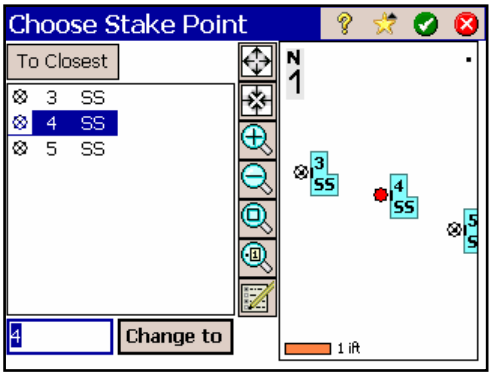
Solve > : opens the next Stake List of Points screen where the current Design Point can be staked.

Note: The screens available after tapping Solve > or Next Point > are identical to Screens Two and Three in the Stake Points routine and are described on pages R-275 through R-276.

Edit Point List

Stakeout | Stake List of Points | Change | or

Stakeout | Stake List of Points | ▼ **Edit List...**



The Edit Point List screen is used to modify the existing point list.

Remove : removes the selected point from the point list.

Clear All : removes all the points from the point list.

To Closest : is available only when the screen is accessed with the Change button. This will automatically select the point in the point list that is nearest to the previously staked point, which is the selected point when the screen if first accessed.

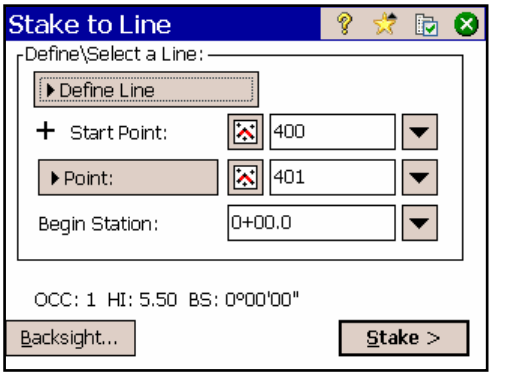
<- Insert / <-Append : will insert the point specified in the corresponding field above the point selected in the point list. When <End> is selected, the point is appended to the end of the list.

Change to : is available only when the screen is accessed with the Change button. This is used to stake the point currently selected in the point list.

Stake to Line

Stakeout | Stake to Line

The Stake to Line screen allows you to locate any location in relation to a predefined line. The line can be defined by two points, a point and direction, a polyline or the centerline of an alignment. Distance, direction and cut/fill information is provided so the rod can locate the line by traveling the shortest possible distance (a perpendicular offset to the line).

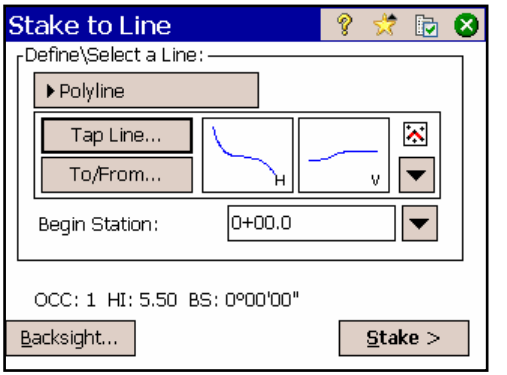


▸ Define Line / ▸ Polyline: When set to Define Line (shown here), a line can be defined by two points or a point and a direction. When set to Polyline, (shown below) the line is defined by an existing polyline or alignment.

Start Point: defines the first point of the line to be staked.

▸ Point / ▸ Direction: defines the second point on the line, or the direction of the line to be staked, respectively.

Begin Station: defines the station associated with the Start Point.



Tap Line...: displays a map of all the polylines and alignments in the current job. Simply tap the line that you want to stake to and then tap .

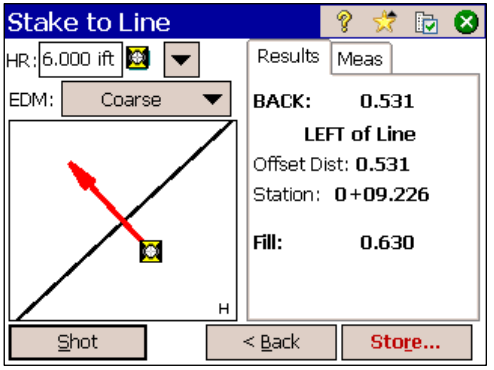
To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Backsight...: opens the Backsight Setup screen (Page R-118).

Stake>: takes you to the second Stake Points screen, described below.

Stake to Line – Screen Two

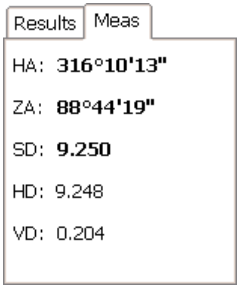
The second screen is where the staking is performed. The graphic display of this screen will change depending on how close the rod is to the specified line. The initial screen that is displayed before a shot is performed shows the position of the total station, the line of the backsight and the specified line to stake. Each type of graphic is displayed below.



HR: is the rod length.

EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

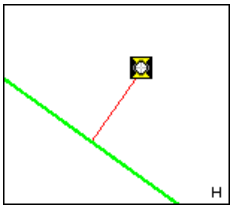
BACK / **FORWARD**: is the distance that the rod must travel BACK (away from the total station) or FORWARD (toward the total station) in order to occupy the specified line.



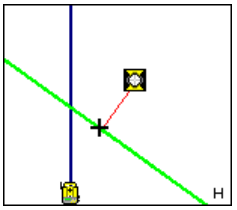
LEFT of Line / **RIGHT of Line** / **ON LINE**: is displayed if the rod is to the left or right side of the line, or is on the line. The LEFT and RIGHT side is determined as if occupying the Start Point and facing the Foresight Point or Direction of the line, specified in Screen One. ON LINE is determined if you are within the Horizontal Distance Tolerance specified in the Stakeout Settings screen (Page R-47).

Offset Dist.: is the perpendicular offset from the specified line to the rod. This is the minimum distance that the rod must travel to occupy the line.

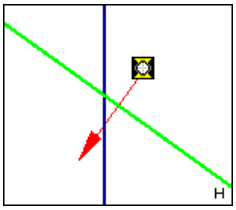
Station: is the station on the specified line where the offset occurs, relative to the Start Point.



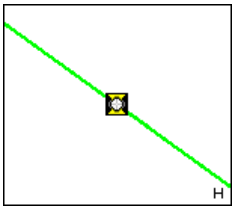
Graphic when prism is greater than 10-feet from the line.



Graphic when prism is between 1-foot and 10-feet from the line.



Graphic when prism is within 1-foot of the line



Graphic when prism is on the line or within the Horizontal Distance Tolerance specified in the Stakeout Settings screen (Page R-47).

Cut / **Fill**: displays the required amount of cut or fill to bring the stake point to the elevation of the reference line at the nearest perpendicular.

Note: If staking beyond the end points of the reference line, or if the reference line is defined by a 2D point, no vertical data is computed.

Meas: contains the information measured by the total station during the previous shot.

Shot: takes a shot to the prism.

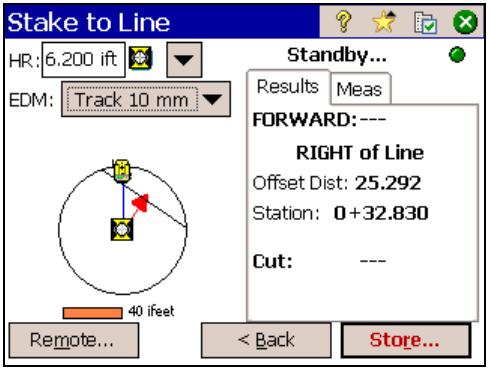
< Back: returns to Screen One.

Store...: opens the Store Point dialog so you can store the last point that was shot.

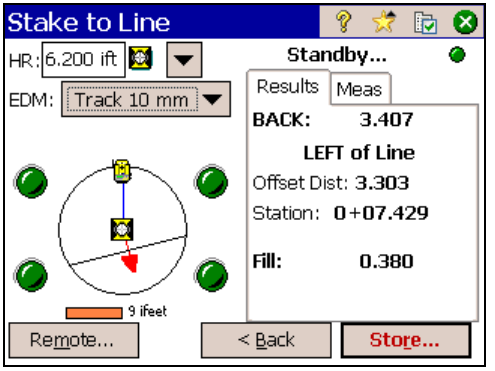
Remote Stake to Line

The contents of the Stake to Line screen when running in remote mode is nearly identical to running in non-remote mode, except the graphic portion of the screen looks and behaves differently. Point the data collector toward the total station for proper orientation and the graphic tells you the direction to travel to reach the line in the shortest distance.

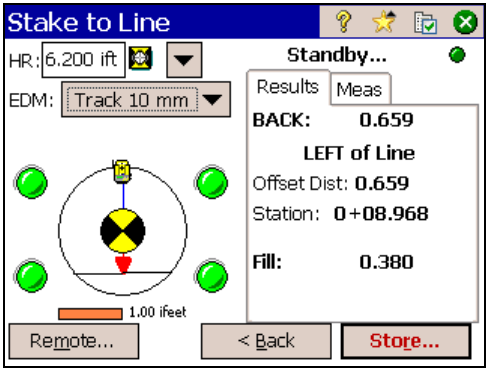
If the Use Manual Updating (Remote Control) field is checked in the Stakeout Settings screen (Page R-47), a Shot button will be available, which allows you to manually control when shots are taken.



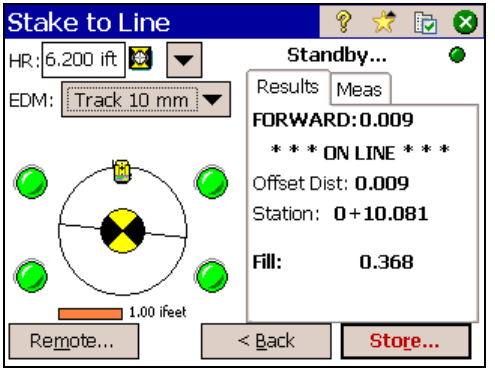
Prism is greater than 10 feet from line.



Prism is between 1 and 10 feet from line.



Prism is within 1 foot of line.

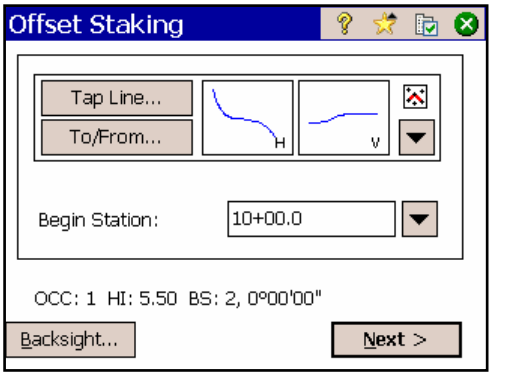


Prism is on the line or within the horizontal distance tolerance specified in the Stakeout Settings screen (Page R-47).

Offset Staking

Stakeout | Offset Staking

The Offset Staking screen is used to stake the center of a road, the road edge, the curb/ditch edge, or any offset at fixed intervals. An existing polyline, alignment, or a specified point range can define the centerline of the road.



The first Offset Staking screen is used to define the centerline of the road that you want to offset stake.

Tap Line...: displays a map of all the polylines and alignments in the current job. Tap the line that you want to offset stake and then tap ✔.

To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

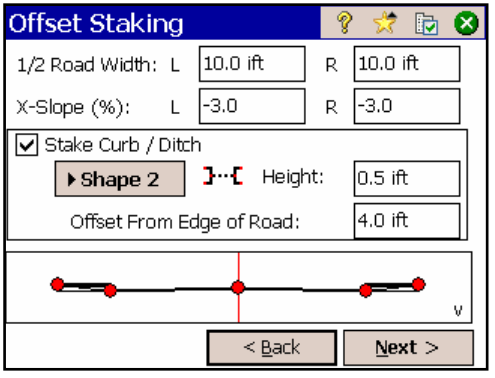
Begin Station: is the station assigned to the first point of the selected polyline or point range.

Backsight...: opens the Backsight Setup screen (Page R-118).

Next>: takes you to the second Offset Staking screen.

Offset Staking – Screen Two

The second Offset Staking screen is used to define the cross section of the road that you want to offset stake.



1/2 Road Width: is the **L**eft and **R**ight width of the road, respectively, from the centerline to the edge of payment. (See diagram below.)

X-Slope (%): is the **L**eft and **R**ight slope of the road, respectively, from the centerline to the edge of payment.

Note: A negative slope will result in water running from the centerline toward the edge of payment.

☑ **Stake Curb / Ditch**: When checked, a curb or ditch and an offset can be defined beyond the edge of the pavement.

Shape 1 / ...2 / ...3 : when the above checkbox is checked, this button allows you to select the shape of the curb, ditch, or slope beyond the edge of pavement so cut / fill information can be computed on this surface if a random offset is specified. The selected shape is displayed by an icon next to the button, as well as with a bold line in the road's cross-sectional profile at the bottom of the screen.

Note: The selected Shape is irrelevant if a random offset is not specified since the nodes are always in the same place for each shape that uses the same Height and Offset values.

Height: is the height of the curb, ditch, or slope in feet or meters. A positive value is considered a curb and a negative value a ditch.

Offset From Edge of Road: is the distance that the curb or ditch extends from the edge of pavement.

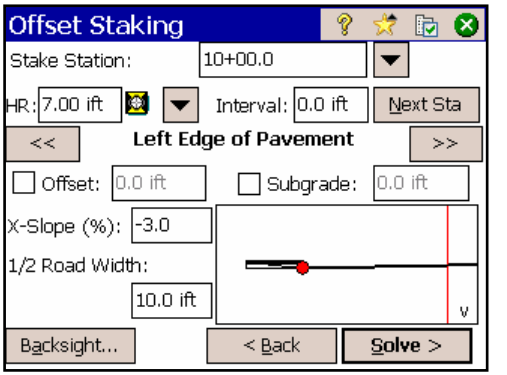
Note: The specified curb or ditch height and offset will be applied to both sides of the road.

< Back: returns to the previous screen.

Next >: opens the next screen.

Offset Staking – Screen Three

The third Offset Staking screen is used to select the station and section of the road to be staked and to specify an offset distance from the design point.



Stake Station: is the station to be staked.

HR: is the rod height.

Interval: Specifies how far to advance from the current station to the next station.

Next Sta: advances the current station by the Station Interval.

Note: When advancing, if you want to also stake the locations where the alignment of the road changes, be sure to check the Stake "Corners", Not Just Even Intervals option in the Stakeout Settings card. Tapping the button will access the Stakeout Settings.

<< / >>: These buttons are used to select the section of the road that you want to stake.

☑ **Offset**: When checked, is the offset distance that will be applied to the selected design point. A positive offset extends from the design point away from the centerline. A negative offset extends towards the centerline.

Subgrade: When checked, allows you to specify a vertical offset from the actual node locations. Positive values result in the stake location

occurring below the selected node. Negative values result in the stake location occurring above the selected node.

X-Slope (%): is the slope of the selected road section.

1/2 Road Width: displays the width of the selected road section defined in the previous screen. This value can quickly be edited from this field.

▼: opens the Smart Target options (Page R-449).

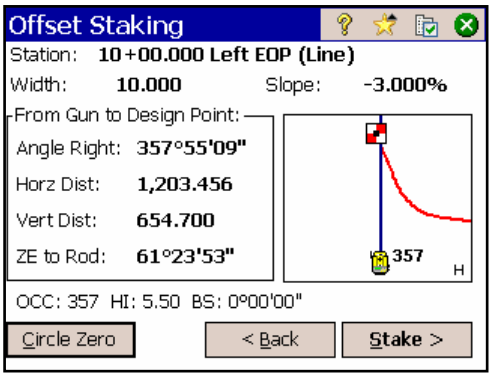
Backsight...: opens the Backsight Setup screen (Page R-118).

< Back: returns to the previous screen.

Solve >: opens the next screen.

Offset Staking – Screen Four

The fourth Offset Staking screen displays the information needed to aim the total station toward the selected design point.



Station: displays the current station and section of the roadway being staked and the current line segment type from the polyline that describes the centerline. If staking the center and an offset was specified, (To L) or (To R) is also displayed to indicate if the offset is to the left or right of the centerline, respectively.

Offset: displays the offset that is applied to the design point.

Slope: displays the slope of the road at the section being staked.

From Gun to Design Point: displays the angle and distance information from the total station to the design point (plus offset if specified).

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing the current target, which can sometimes be easier than turning to an obscure angle value. When this button is tapped, the following actions will occur:

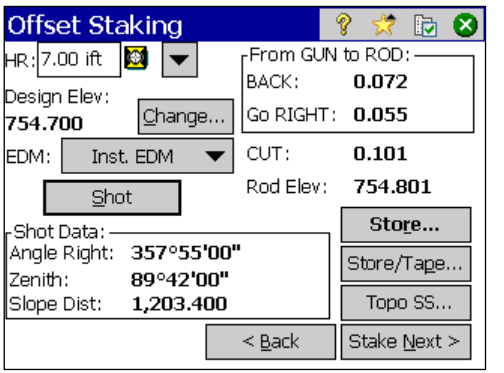
1. A new backsight circle value is computed, sent to the instrument and stored in the raw data
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the current target location.
3. To prevent errors if this button is used, the backsight set up is invalidated when exiting the Stakeout dialog. A circle zeroed on a design point is meaningless once the design point has been staked.

Note: The Circle Zero button is not available when using a robotic total station.

< Back: returns to the previous screen.

Stake >: opens the next screen.

Offset Staking – Screen Five



Height of Rod: is the length of the rod.

Design Elev: displays the current design elevation, which can be modified with the Change... button.

FORWARD / **BACK**: indicates if the rod must move forward (toward the total station) or backward (away from the total station).

Go RIGHT / **Go LEFT**: indicates if the rod must move to the right or left from the total station's point of view.

EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

CUT / **FILL**: displays the required amount of cut or fill to bring the stake point to the design point's elevation.

Rod Elev: displays the elevation at the rod's location computed from the last shot.

Change...: is used to modify the current design elevation, which will also modify the associated CUT/FILL value for the current station being staked.

Shot: takes a shot to the prism and computes come/go, cut/fill information.

Shot data: displays the measurements from the last shot.

Store...: opens the next screen.

Store/Tape...: opens the Stake Out Point (Tape Offset) dialog box (Page R-309), where the staked point can be stored that includes a specified offset. The default value is the appropriate distance correction to the design point.

Topo SS...: stores a side shot using the data from the last shot taken. (This will not take a new shot.)

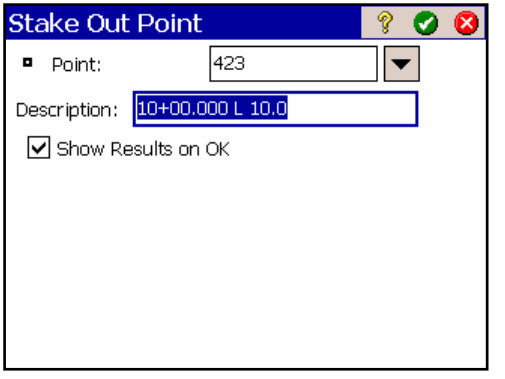
Turn Gun: (available with robotic total station) turns the total station toward the design point.

< Back: returns to the second screen.

Stake Next >: returns you to the second Stake Road screen, without storing a stake point, where the Design point is advanced by the Increment value.

Offset Staking – Screen Six

This screen is used to describe the stake point before it is stored and select if the Results screen should be displayed (described next).



Point: is the point name for the stake point being stored.

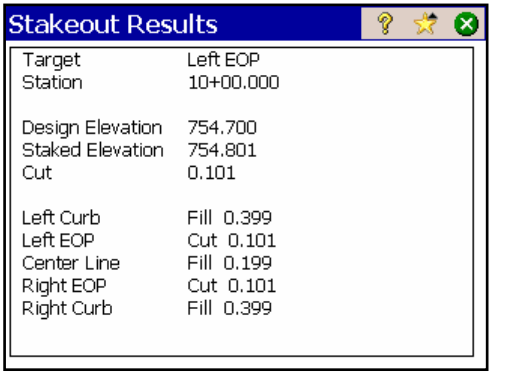
Description: is the description for the stake point being stored. The default description is the station, side, and distance from the centerline for the design point.

Show Results on OK: When this checkbox is checked, a Results screen (described next) will open after tapping ✔ from this screen.

Note: This screen will not appear if the Write Cut Sheet Data Only (No Store Point) checkbox is checked in the Stakeout Settings screen, although the Results screen will still appear if the Show Results on OK checkbox was never unchecked from this screen. (It is checked by default.)

Offset Staking – Stakeout Results

This screen shows detailed cut/fill values, which may be needed when marking a road or offset stake.

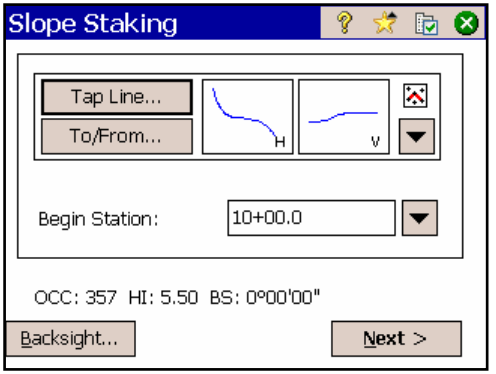


✖: returns you to the second Offset Staking screen where the Design point is advanced by the Increment value.

Slope Staking

Stakeout | Slope Staking

The Slope Staking screen is used to locate the catch points for a roadway in any terrain.



The first screen is used to define or select the line that describes the centerline of the road to be slope staked. An existing polyline or alignment can be selected, or a series of existing points can be entered to define the centerline.

Tap Line...: allows you to tap an existing polyline or alignment that defines the centerline of the road.

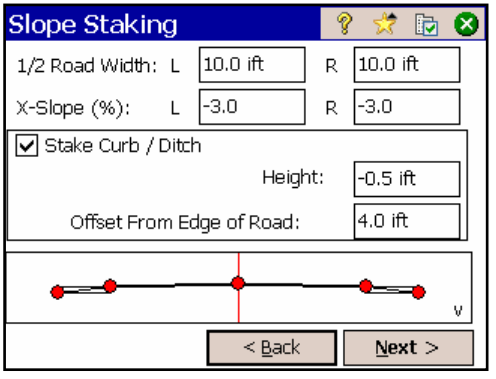
To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Begin Station: defines the station at the beginning of the centerline.

Backsight...: opens the Backsight Setup screen.

Next>: opens the next screen.

Slope Staking – Screen Two



The second screen is used to describe the profile of the road.

1/2 Road Width: is the horizontal width of **L**eft and **R**ight sides of the road, respectively, from the centerline to the nearest edge of the curb or ditch.

X-Slope: is the cross slope of the **L**eft and **R**ight sides of the road, respectively. The slope is computed from $\left(\frac{\text{Rise}}{\text{Run}} \cdot 100\right)$. (A negative slope will

cause water to run from the centerline toward the edge.)

☑ **Stake Curb / Ditch**: When checked, this allows you to include a curb or ditch in the road profile.

Height: defines the height of the curb, or depth of the ditch. (A negative value would be used to define the depth of a ditch.)

Offset From Edge of Road: defines the width of the curb or ditch.

< Back: returns to the previous screen.

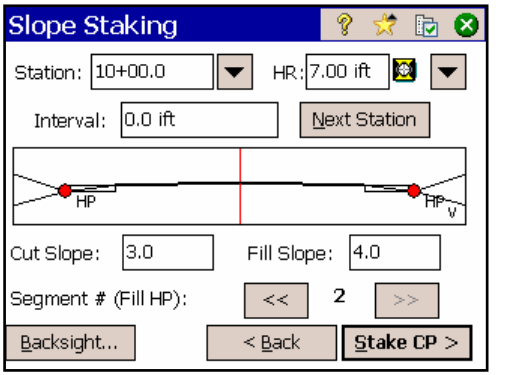
Next >: opens the next screen.

Slope Staking – Screen Three

Station to Stake: is the station that will be staked next.

Station Interval: is the value that is added to the Station to Stake after the Next Station button is pressed.

Next Station: advances the Station to Stake by the Station Interval.



Note: If the Stake Corners option is selected in the Stakeout Settings screen, the Next Station button will also stop at any horizontal or vertical alignment node that falls within the interval.

Fill Slope: is the desired slope, calculated from rise over run, between the hinge point and catch point when the area requires a fill.

Cut Slope: is the desired slope, calculated from rise over run, between the hinge point and catch point when the area requires a cut.

Segment # (Fill HP): when the terrain requires a fill, you have the option to compute the hinge point from either side of the second segment. The option to use segment # 1 can simplify the situation

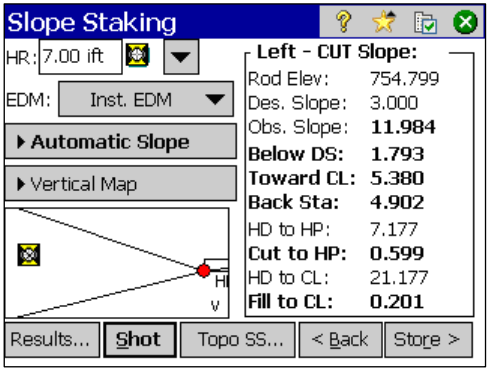
where a ditch meets an area requiring a fill, which would otherwise result in an area with two similar or identical negative slopes.

< Back: returns to the previous screen.

Stake CP >: opens the next screen.

Slope Staking – Screen Four

The fourth screen is used to perform the actual slope staking shots.



Height of Rod: is the rod height.

EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

The first button selects the type of slope that will be used between the catch point and hinge point from the following options:

- Automatic Slope: selects the slope based on the current rod position. If the rod is above the hinge point, a cut slope is computed. If the rod is below the hinge point, a fill slope is computed.
- Force CUT Slope: forces all computations to be based on a cut slope.
- Force FILL Slope: forces all computations to be based on a fill slope.

The second button selects which information is displayed in the lower corner of the screen from the following options:

- Vertical Map: displays a cross-sectional view at the current station.

Note: When you tap a map view, an expanded view of the same map will fill the screen.

Note: The Vertical Map will show an X at the location of each previous shot. This can be useful in determining if the current terrain will never intersect the slope (no catch point).

- ▸ Horizontal Map: displays an overhead view of the job.
- ▸ Shot Data: displays the shot data for the latest shot.

Left / Right: displays if a Cut or Fill slope is being computed and if it is on the Left or Right side of the road, respectively.

Rod Elev: is the current elevation at the rod location.

Des. Slope: is the design cut or fill slope.

Obs. Slope: is the computed (observed) cut or fill slope based on the last shot and the corresponding hinge point.

Cut / Fill: is the cut or fill required for the current rod location to be positioned on the design slope.

Toward CL / Away CL: is the computed horizontal distance that the rod must move either toward the centerline or away from it, respectively, before it is positioned at the catch point.

Note: The computed horizontal distance is based on the observed terrain computed from the last two shots. If only one shot has been taken, it is assumed that the terrain is level when computing this value.

On Station / **Back Sta** / **Ahead Sta**: informs you if the rod is on the station being staked, or the distance it must move (parallel to the centerline) back or ahead to be on the correct station.

HD to HP: is the horizontal distance from the rod to the hinge point.

VD to HP: is the vertical distance from the rod to the hinge point.

HD to CL: is the horizontal distance from the rod to the centerline.

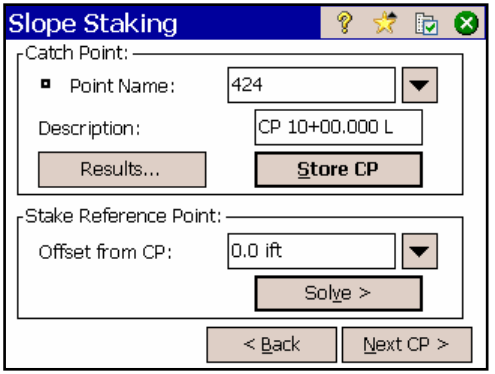
VD to CL: is the vertical distance from the rod to the centerline.

Topo SS...: will store the last shot taken as a side shot.

< Back: returns to the previous screen.

Store >: opens the next screen.

Slope Staking – Screen Five



The fifth screen is used to store a point for the last shot taken from the previous screen, which should be located at the catch point.

Point Name: is the name assigned to the stored point.

Description: is the description assigned to the stored point.

Store CP: stores the point.

Offset from CP: This field is used if you want to stake another location that is at the specified horizontal distance from the catch point away from the road.

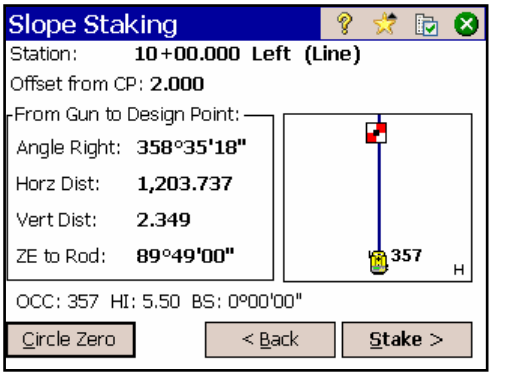
Solve >: opens a new screen, described next, used to stake the point at the offset specified above.

< Back: returns to the previous screen.

Next CP >: returns to the third slope staking screen where the station to stake can be advanced and the next catch point can be located.

Slope Staking Offset Stake

The following screens are only accessed if you choose to stake a point at a specified offset away from the catch point.



Station: displays the current station being slope staked.

Offset from CP: is the offset from the catch point specified in the previous screen.

From Gun to Design Point: displays the angle and distance information from the total station to the design point.

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing the current target, which can sometimes be easier than turning to an obscure angle value. When this button is tapped, the following actions will occur:

1. A new backsight circle value is computed, sent to the instrument and stored in the raw data
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the current target location.
3. To prevent errors if this button is used, the backsight set up is invalidated when exiting the Stakeout dialog. A circle zeroed on a design point is meaningless once the design point has been staked.

Note: The Circle Zero button is not available when using a robotic total station.

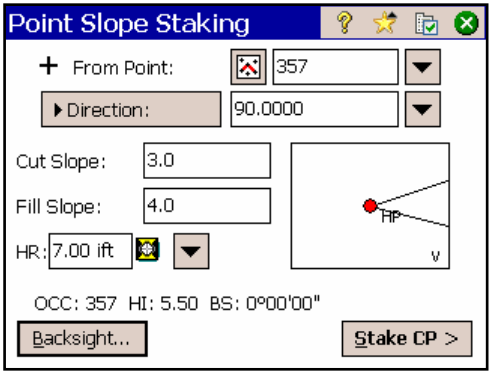
< Back: returns to the previous screen.

Stake >: opens the next screen, which is identical to the third Stake Points screen, described on Page R-276.

Point Slope Staking

Stakeout | Point Slope Staking

The Point Slope Staking routine is a simplified version of the Slope Staking routine described on Page R-293.



The Point Slope Staking routine determines the location of the catch point from a known hinge point and a specified horizontal direction from the hinge point, whereas the Slope Staking routine determines the location of the catch point from a perpendicular offset to a known centerline at a specified station.

The first screen is used to specify the hinge point and horizontal direction from the hinge point to the catch point.

From Point: is the hinge point.

▸ Point / ▸ Direction: is either another point that lies in the same vertical plane as the hinge point and catch point, or the azimuth from the hinge point to the catch point, respectively.

Fill Slope: is the desired slope, calculated from run over rise, between the hinge point and catch point when the area requires a fill.

Cut Slope: is the desired slope, calculated from run over rise, between the hinge point and catch point when the area requires a cut.

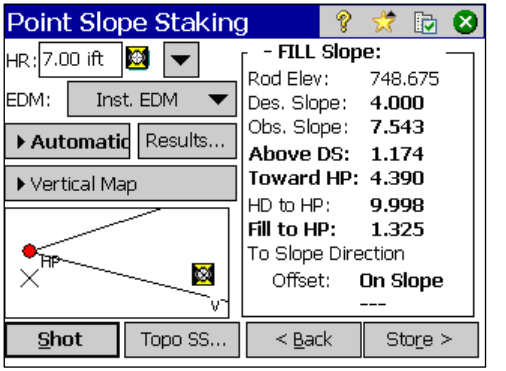
Height of Rod: is the rod height.

Backsight...: opens the Backsight Setup screen.

Stake CP >: opens the next screen.

Point Slope Staking – Screen Two

The second screen is used to perform the actual point slope staking shots.



Rod Elev: is the current elevation at the rod location.

Des. Slope: is the design cut or fill slope.

Obs. Slope: is the computed (observed) cut or fill slope based on the last shot and the corresponding hinge point.

HD to HP: is the horizontal distance from the rod to the hinge point.

Cut to HP / Fill to HP: is the cut or fill required to bring the current rod location level with the hinge point.

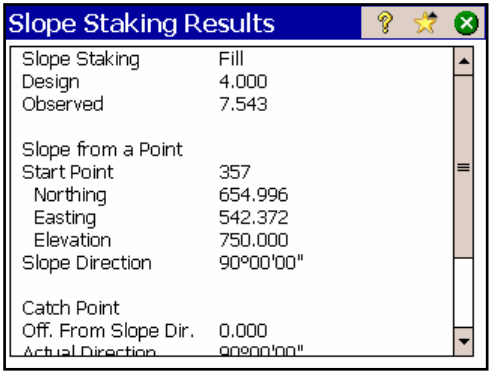
To Slope Offset: is the perpendicular offset between the rod location and the horizontal line from the hinge point to the catch point.

Direction (**CW** or **CCW**): is the horizontal angle (clockwise or counterclockwise, respectively) that the rod must turn around the hinge point for it to be over the line from the hinge point to the catch point.

Below DS / Above DS: is the vertical distance that the rod is located below or above the design slope. If the Automatic Slope option is selected, this will be the distance to the nearest slope, otherwise it will be the distance to the selected (cut or fill) slope.

Toward HP / **Away HP**: is the estimated horizontal distance the rod must move toward or away from the hinge point before it is over the catch point.

Note: The computed horizontal distance is based on the observed terrain computed from the last two shots. If only one shot has been taken, this value will be blank.



EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

- Results: This will open the Slope Staking Results screen, listing detailed information for the current setup and last shot.

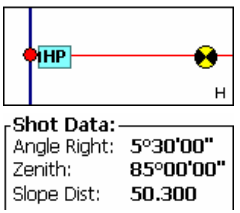
Note: The Results button is only available from the Store Catch Point screen when using GPS or Remote mode, which is accessed after tapping Store >.

The button described below selects which information is displayed in the screen from the following options:

- ▸ Vertical Map: displays a cross-sectional view at the current station.

Note: When you tap a map view, an expanded view of the same map will fill the screen.

Note: The Vertical Map will show an X at the location of each previous shot. This can be useful in determining if the current terrain will never intersect the slope (no catch point).



- ▸ Horizontal Map: displays an overhead view of the job.
- ▸ Shot Data: displays the shot data for the last shot.

The button described below selects the type of slope that will be used from hinge point to the catch point from the following options:

- ▸ Automatic Slope: selects the slope that is nearest to the current rod position.
- ▸ Force CUT Slope: forces all computations to be based on a cut slope.
- ▸ Force FILL Slope: forces all computations to be based on a fill slope.

HR: is the rod height.

▼: opens the Smart Target options (Page R-449).

Topo SS...: will store the last shot taken as a side shot.

Shot: takes a shot.

< Back: returns to the previous screen.

Store >: opens the next screen.

Point Slope Staking – Screen Three

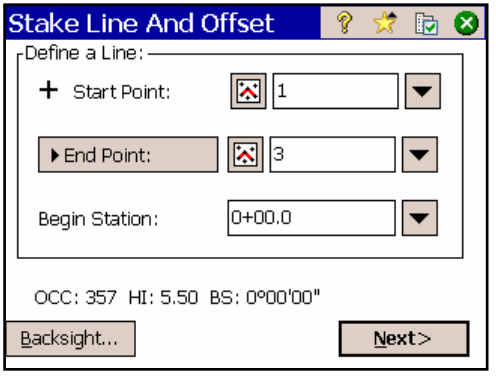
The third Point Slope Staking screen is identical to the fifth Slope Staking screen and is described on Page R-297.

Stake Line and Offset

Stakeout | Line and Offset

The Stake Line and Offset screen is used to stake stations on a line, or at an offset to it, at fixed intervals.

: opens the Stakeout Settings screen (Page R-47).



Start Point: defines the first point of the line to be staked.

End Point / Direction: defines the second point of the line, or the direction of the line to be staked, respectively.

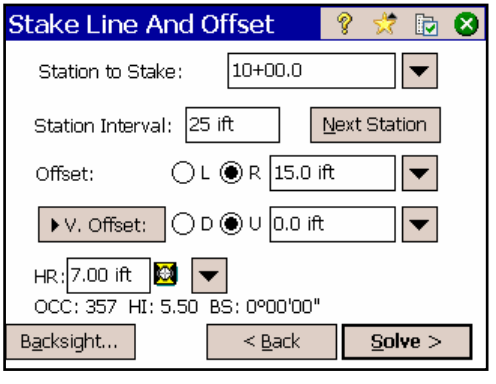
Begin Station: defines the station associated with the Start Point.

Backsight...: opens the Backsight Setup screen (Page R-118).

Next>: opens Screen Two.

Stake Line and Offset – Screen Two

Station to Stake: is the desired station that you want to stake.



Station Interval: is the value that is added to the Station to Stake after the Next Station button is pressed.

Next Station: advances the Station to Stake by the Station Interval.

Offset: defines the offset distance and if the offset occurs to the right of the line, when R is selected, or left, when L is selected. The right or left side is referenced while viewing the line from the Start Point.

▸Vertical Offset: is the offset distance that is below the design location (when ◉D is selected) or above the design location (when ◉U is selected).

▸Grade: specifies a slope from the specified line to the parallel line that is being staked. When this is a non-zero value, the elevation for the staked points will increasingly differ from the design elevations as the Offset value increases.

Height of rod: is the length of the rod.

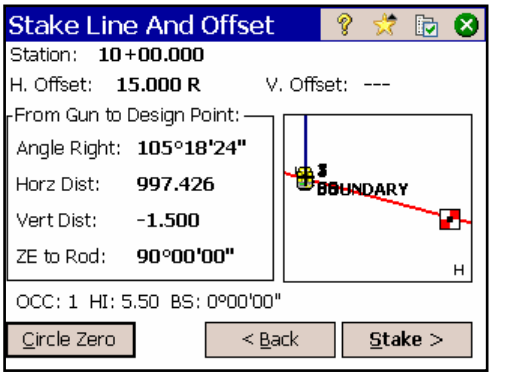
Backsight...: opens the Backsight Setup screen.

< Back: returns to the previous screen.

Solve>: opens the third Stake Line and Offset screen, described next.

Note: A motorized total station will automatically turn toward the design point after pressing Solve> depending on the configuration of the Stakeout Settings screen (Page R-47).

Stake Line and Offset – Screen Three



Station: displays the current station that is being staked.

H. Offset: displays the offset distance of the line being staked from the specified line and if it is on the Right or Left side of the specified line.

From Gun to Design Point: displays the direction and distance that the total station must aim toward so that it is facing the current station.

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing the current target, which can sometimes be easier than

turning to an obscure angle value. When this button is tapped, the following actions will occur:

1. A new backsight circle value is computed, sent to the instrument and stored in the raw data
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the current target location.
3. To prevent errors if this button is used, the backsight set up is invalidated when exiting the Stakeout dialog. A circle zeroed on a design point is meaningless once the design point has been staked.

Note: The Circle Zero button is not available when using a robotic total station.

< Back: returns to the previous screen.

Stake >: opens the fourth Stake Line and Offset screen, which is identical to the third Stake Points screen, described on Page R-276.

Note: Tap the graphic portion of the screen for an expanded view.

Screen Summary

Screen One is used to define the primary line used to determine the location of the line to be staked and the station associated with the Start Point.

Screen Two is used to define the offset distance and location, the station to be staked and the station interval.

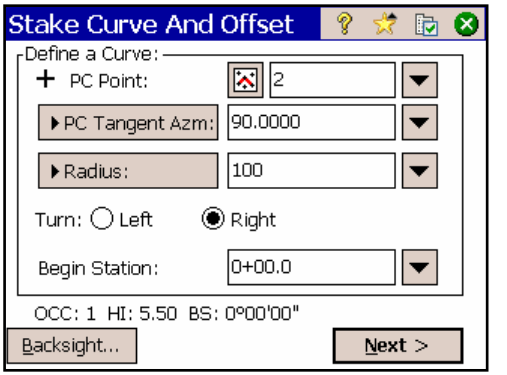
Screen Three provides the distance and direction information to the current station to be staked.

Screen Four is used to stake the current station.

Stake Curve and Offset

Stakeout | Curve and offset

The Stake Curve and Offset screen is used to stake stations on a curve or at an offset to it at fixed station intervals.



: opens the Stakeout Settings screen (Page R-47).

PC Point: is the starting point of the curve (point of curvature).

PC Tangent Azm / PC Tangent Brg: defines the azimuth or bearing, respectively, of the tangent at the PC Point.

Radius / Degree Arc / Degree Chord: defines the radius, degree arc, or degree chord of the curve, respectively.

Turn: defines if the curve turns to the Left or Right from the point of view of the PC.

Begin Station: is the station assigned to the PC Point.

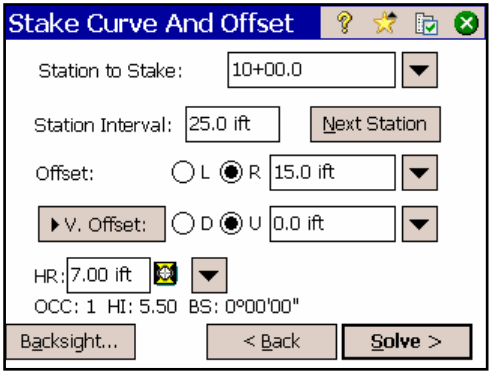
Backsight...: opens the Backsight Setup screen (Page R-118).

Next>: takes you to the second Stake Curve and Offset screen, described below.

Curve and Offset – Screen Two

Station to Stake: is the desired station on the curve that you want to stake.

Station Interval: is the value that is added to the Station to Stake after the Next Station button is pressed.



Next Station: advances the Station to Stake by the Station Interval.

Offset: is the horizontal distance of the offset from the specified curve. The offset occurs on the left (while viewing the curve from the PC) when the ◉ L is selected or on the right when the ◉ R is selected.

Note: An offset of zero would result in the specified curve being staked.

▸ V. Offset: will result in the elevations for the design points to be adjusted by the value entered here and will change the cut / fill values accordingly. Design elevations will be lower when ◉ D is selected, and higher when ◉ U is selected.

▸ Grade: specifies a slope from the specified curve to the offset that is being staked. When this is a non-zero value, the elevation for the staked points will increasingly differ from the corresponding design elevations on the specified curve as the Offset value increases.

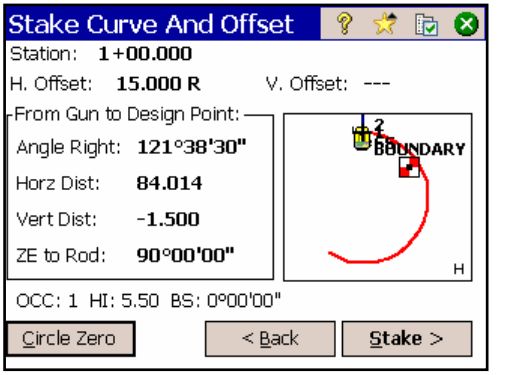
Height of Rod: is the length of the rod.

< Back: returns to the previous screen.

Solve>: opens the third Stake Curve and Offset screen, described next.

Note: A motorized total station will automatically turn toward the design point after tapping Solve>, depending on the configuration of the Stakeout Settings screen (Page R-47).

Curve and Offset – Screen Three



Station: displays the current station that is being staked.

H. Offset: displays the offset distance of the curve being staked from the specified curve and if it is on the Right or Left side of the specified curve.

Angle Right: is the horizontal angle that the total station must aim toward so that it is facing the current station.

Horz. distance: is the horizontal distance from the occupy point to the current station.

Vert Distance: is the vertical distance from the occupy point to the current station.

ZE to Rod: is the zenith angle that the total station must aim toward so that it is facing the current station.

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing toward the design point, which can sometimes be easier than turning to an obscure angle value. When this button is tapped, the following actions will occur:

1. A new backsight circle value is computed, sent to the instrument and stored in the raw data.
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the design point.
3. To prevent errors, the backsight set up is invalidated when exiting the Stakeout dialog if this button has been used. A circle zeroed on a design point is meaningless once the design point has been staked.

Note: The Circle Zero button is not available when using a robotic total station.

< Back: returns to the previous screen.

Stake >: opens the next screen, which is identical to the third Stake Points screen, described on Page R-276.

Screen Summary

Screen One is used to define the primary curve to determine the location of the curve to be staked and the station associated with the PC Point.

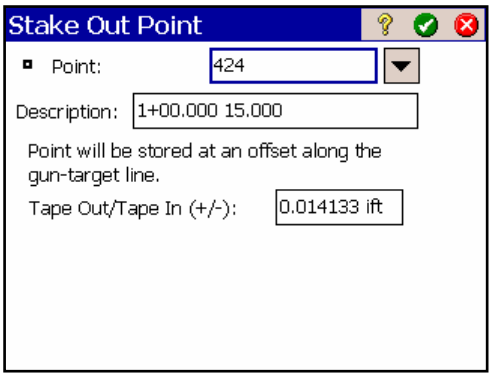
Screen Two is used to define the offset distance and location, the station to be staked and the station interval.

Screen Three provides the distance and direction information to the current station to be staked from the occupy point.

Screen Four is used to stake the current station.

Stake Out Point (Tape Offset)

The Store Point (Tape Offset) dialog box allows you to store a point at a specified offset from the stake point, resulting in a point that is either closer to, or further away from the total station.



Point: is the name assigned to the new offset point.

Description: is the description assigned to the new offset point.

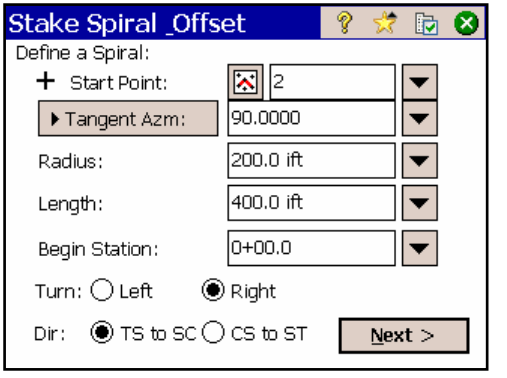
Tape Out/Tape In: is the specified offset from the stake point. A positive value will result in a new point that is further away from the total station. The default value is the appropriate distance correction to the design point.

: stores the new offset point.

Stake Spiral and Offset

Stakeout | Spiral and Offset

The Stake Spiral and Offset screen allows you to stake stations at fixed intervals on a spiral curve, or at an offset to it.



Start Point: is the point associated with the beginning of the spiral curve. This can either be the TS or the CS, which is specified later in this screen (see below).

Tangent Azm | Tangent Bearing: defines the tangent azimuth or bearing at the entrance to the spiral

Radius | Degree Arc | Degree Chord: defines the radius, degree arc, or degree chord of the curve, respectively.

Length: is the length of the spiral curve.

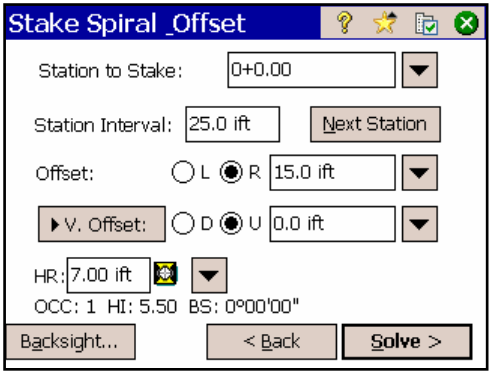
Begin Station: is the station associated with the Start Point.

Turn: defines if the curve turns toward the Left or Right from the point of view of the Start Point.

Spiral: defines the direction of the spiral curve by the following options:

- **TS to SC**: the spiral begins at the tangent (Tangent to Spiral) and ends at the circular curve (Spiral to Curve).
- **CS to ST**: the spiral begins at the circular curve (Curve to Spiral) and ends at the tangent (Spiral to Tangent).

Stake Spiral and Offset – Screen Two



Station to Stake: is the desired station on the spiral curve that you want to stake.

Station Interval: is the value that is added to the Station to Stake after the Next Station button is pressed.

Next Station: advances the Station to Stake by the Station Interval.

Offset: is the horizontal distance of the offset from the spiral curve. The offset occurs on the left (while viewing the spiral from the Start Point) when the ⊙L is selected or on the right when ⊙R is selected.

Note: An offset of zero would result in the spiral curve itself being staked.

▸V. Offset: will result in the elevations for the design points to be adjusted by the value entered here and will change the cut / fill values accordingly. Design elevations will be lower when is selected, and higher when ⊙U is selected.

▸Grade: specifies a slope from the spiral curve to the curve that is being staked. When this is a non-zero value, the elevation for the staked points will increasingly differ from the corresponding design elevations on the spiral curve as the Offset value increases.

Height of rod: is the length of the rod.

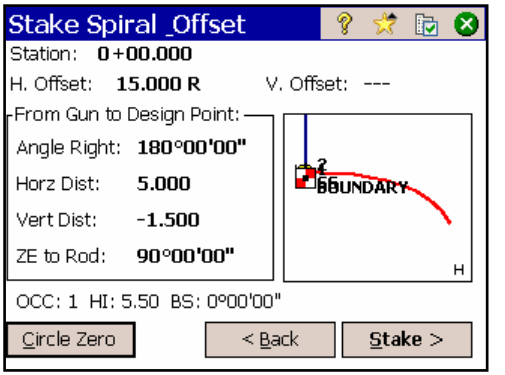
Backsight...: opens the Backsight Setup screen (Page R-118).

< Back: returns to the previous screen.

Solve>: opens the third screen, described next.

Note: A motorized total station will automatically turn toward the design point after pressing Solve> depending on the configuration of the Stakeout Settings screen (Page R-47).

Stake Spiral and Offset – Screen Three



Station: displays the current station that is being staked.

H. Offset: displays the offset distance of the spiral curve being staked from the specified spiral curve and if it is on the Right or Left side of the specified spiral curve.

Angle Right: is the horizontal angle that the total station must aim toward so that it is facing the current station.

Horz Dist: is the horizontal distance from the occupy point to the current station.

Vert Dist: is the vertical distance from the occupy point to the current station.

ZE to Rod: is the zenith angle that the total station must aim toward so that it is facing the current station.

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing toward the design point, which can sometimes be easier than turning to an obscure angle value. When this button is tapped, the following actions will occur:

1. A new backsight circle value is computed, sent to the instrument and stored in the raw data
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the design point.

3. To prevent errors, the backsight set up is invalidated when exiting the Stakeout dialog if this button has been used. A circle zeroed on a design point is meaningless once the design point has been staked.

Note: The Circle Zero button is not available when using a robotic total station.

< Back: returns to the previous screen.

Stake >: opens the next screen, which is identical to the third Stake Points screen, described on Page R-276.

Stake Spiral and Offset – Screen Summary

Screen One is used to define the primary spiral curve used to determine the location of the curve to be staked and the station associated with the Start Point.

Screen Two is used to define the offset distance and location, the station to be staked and the station interval.

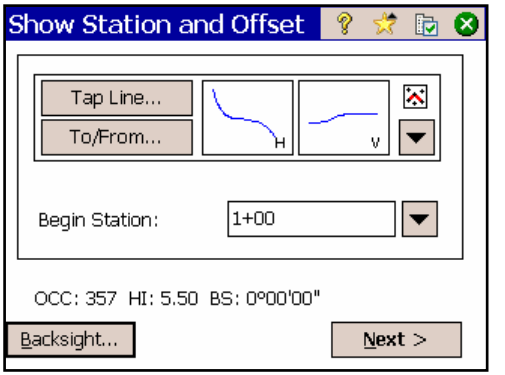
Screen Three provides the distance and direction information to the current station to be staked from the occupy point.

Screen Four is used to stake the current station.

Show Station

Stakeout | Show Station

The Show Station routine allows you to take a shot to a prism that is positioned anywhere near a polyline, a range of points that define a line, or an alignment to see where the prism is located in relation to the line.



Tap Line...: allows you to tap an existing polyline or alignment that the station and offset will be computed from.

To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

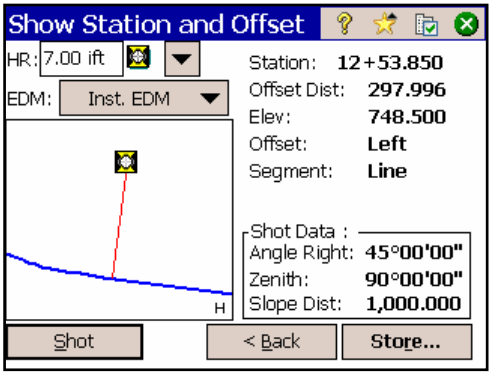
Begin Station: is the station assigned to the beginning of the line.

Backsight...: opens the Backsight Setup screen (Page R-118).

Next >: takes you to the next Show Station and Offset screen where the slope staking parameters are set up.

Show Station and Offset – Screen Two

The second Show Station and Offset screen is used to take a shot to the prism and view the data.



Height of Rod: is the length of the rod.

EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

Station: displays the station at the rod position.

Offset Dist: displays the perpendicular offset from the centerline to the rod position.

Elev: displays the elevation at the rod position.

Offset: displays if the rod position is to the right of the line, left of the line, or on the line.

Segment: displays the name of the template's segment at the rod position.

Shot Data: displays the angles and distance measured by the total station from the last shot.

Shot: takes a shot to the prism.

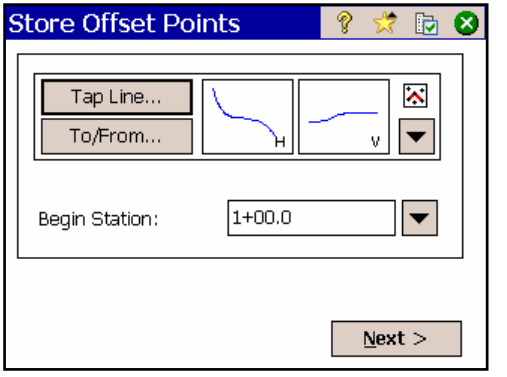
< Back: returns to the previous screen.

Store...: stores the stake point.

Store Offset Points

Stakeout | Store Offset Points

The Store Offset Points screen is used to store points in the current job at a specified offset from an existing polyline or alignment at a specified interval.



Tap Line...: allows you to tap an existing polyline or alignment that the station and offset will be computed from.

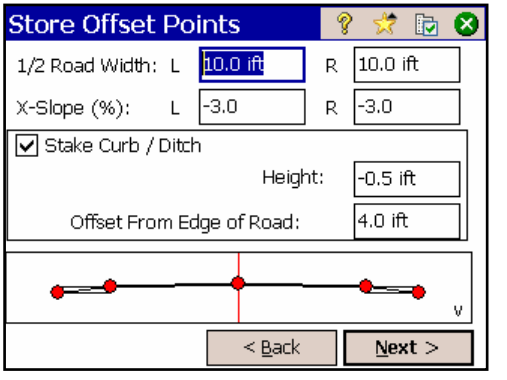
To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Begin Station: is the station assigned to the beginning of the line.

Next >: takes you to the next Store Offset Points screen where the slope staking parameters are set up.

Store Offset Points – Screen Two

The second Store Offset Points screen is used to define the road profile, or offset distances that will be used to compute the offset point coordinates.



1/2 Road Width: is the Left and Right width of the road, respectively, from the centerline to the edge of payment.

X-Slope (%): is the Left and Right slope of the road, respectively, from the centerline to the edge of payment calculated from $\frac{\text{Rise}}{\text{Run}} \cdot 100$.

Note: A negative slope will result in water running from the centerline toward the edge of payment.

☑ **Stake Curb / Ditch**: When checked, a curb or ditch and an offset can be defined beyond the edge of the pavement.

Height: is the height of the curb or ditch in feet or meters. A positive value is considered a curb and a negative value a ditch.

Offset From Edge of Road: is the distance that the curb or ditch extends from the edge of pavement.

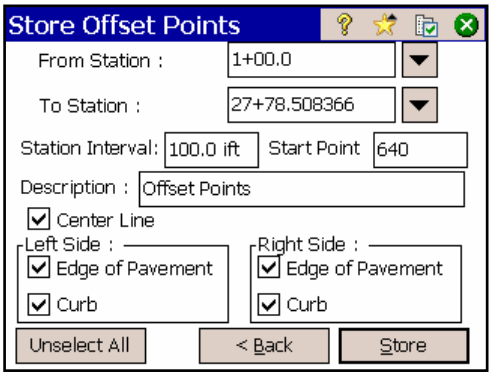
Note: The specified curb or ditch height and offset will be applied to both sides of the road.

< Back: returns to the previous screen.

Next >: opens the next screen.

Store Offset Points – Screen Three

The third Store Offset Points screen is used to define which offset points will be stored.



From Station: is the station where the stored offset points will begin.

To Station: is the station where the stored offset points will end.

Station Interval: is the distance between the stations where offset points are stored.

Note: If the Stake Corners option is selected in the Stakeout Settings screen, offset points will also be stored where ever the horizontal or vertical section of the road changes.

Start Point: is the point number that will be assigned to the first offset point that is stored. Each stored point that follows will be assigned the next available point number.

Description: is the description that will be assigned to all the offset points that are stored.

☑ **Center Line**: offset points will be stored at locations on the centerline when checked.

☑ **Edge of Pavement**: offset points will be stored at the end of the first segment (the edge of the roadbed) on the left and/or right side when checked.

☑ **Curb**: offset point will be stored at the end of the second segment (the end of the curb or ditch) on the left and/or right side when checked.

Unselect All: quickly un-checks all the checkboxes.

< Back: returns to the previous screen.

Store: stores all the offset points based on the information provided.

Stake DTM

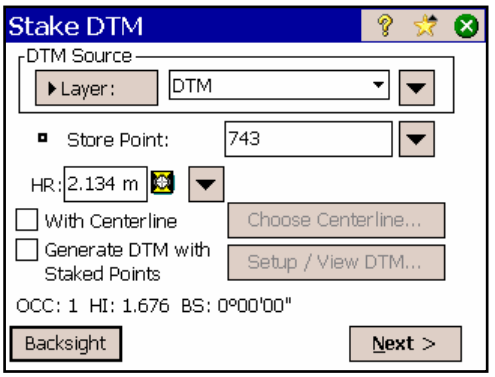
Stakeout | Stake DTM

The Stake DTM routine allows you to stake an area and get cut/fill information between the point being staked and a reference DTM surface at the same horizontal coordinates. You can also obtain volume information between the surface being staked and a specified reference elevation or the reference DTM surface.

The reference DTM surface can be defined by a layer in the current job or a file loaded on the data collector. Either a DXF file containing a triangulated irregular network (TIN) or a digital terrain model (DTM) file can be used.

Consult the User's manual for more information.

Note: The speed performance of the Stake DTM routine is enhanced when using a DTM file as opposed to a DXF file.



DTM Source: is where you select your reference DTM surface. If using a layer, toggle the button to Layer and then select the layer from the dropdown list. If using a DTM or DXF file, toggle the button to File and then tap the power button and Browse then select the appropriate file.

Warning: If importing a DXF or DTM file where the distance units in the source file are different than the distance units for the current job, the imported coordinates will be converted to the current job's distance units when they are imported. This is normally the desired result, but it can cause a problem if the distance units for the imported data or the current job were set incorrectly. This situation can most commonly occur when working with International Feet and US Survey Feet, where the conversion from one to the other is not always obvious.

Usually the difference between International Feet and US Survey Feet is negligible (2 parts per million), but when dealing with State Plane or UTM mapping plane coordinates, which are often very large in magnitude, the difference can be considerable if the coordinates are converted from one format to the other.

If importing coordinates from a source where you are not sure if the units are in International Feet or US Survey Feet into a job that is set to International Feet or US Survey Feet, you will usually just want to import them without any conversion being performed. To do this, be sure to select the same distance units for the source file as those set for the current job.

Store Point: is the starting point number if points are stored during the staking process. Future points are stored with the next available point names.

HR: is the rod height.

▼: opens the Smart Target options (Page R-449).

☑ **With Centerline**: When checked, offset and stationing information from the selected centerline to the stake point is also provided in the DTM Shot screen.

Choose a Centerline...: will open the Select Line screen, described next, where an existing polyline or alignment can be selected that describes a centerline.

☑ **Generate DTM with Staked Points**: will add any staked points to the non-reference DTM layer and generate a DTM surface for all the objects on this layer. This DTM surface will be updated when a new

point is stored to it. You can also view this surface with live cut/fill volumes at anytime from the 3D View screen (Page R-85).

Note: Viewing the DTM during DTM Stakeout is a useful quality assurance technique to determine where additional points are needed.

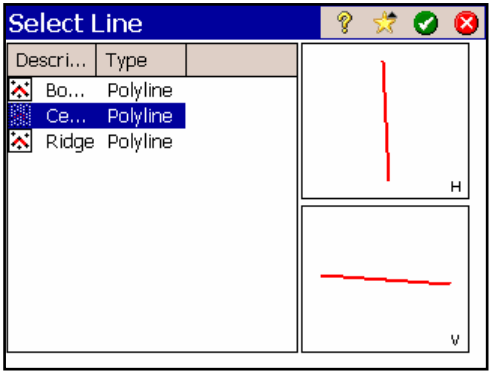
Setup / View DTM: opens the Setup DTM 3D screen (Page R-80) where the non-reference DTM layers are configured and optionally viewed from the 3D View screen (Page R-85).

Backsight: opens the Backsight Setup screen (Page R-118) where the current backsight can be modified.

Next >: opens the next screen.

Choose a Centerline

Stakeout | Stake DTM | Choose a Centerline...



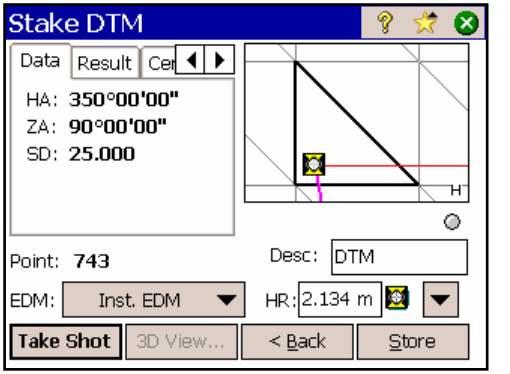
The Select Line screen is used to select a particular polyline or alignment that defines a centerline. Separate overhead and side views are displayed for the selected polyline.

Simply select the desired line and tap ✔.

Stake DTM – Screen Two

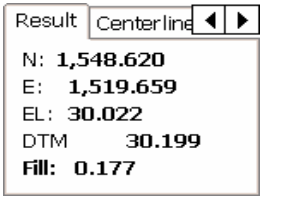
Stakeout | Stake DTM | Next >

The second Stake DTM screen displays all relevant information for the current rod position and a graphic that shows the reference DTM surface and its corners. Once a shot is taken, the rod location and the occupied TIN triangle are displayed.



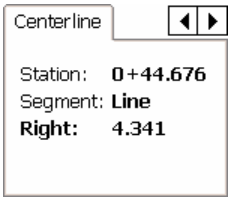
Data: shows the angle and distance information from the previous shot.

Result: shows the current northing, easting, and elevation of the rod as well as the computed elevation of the reference DTM at the current location and the cut or fill necessary to bring the elevation at the current location to the elevation of the reference DTM at the current location.



Note: If the DTM and Cut or Fill fields are blank after taking a shot, it indicates the rod is outside the reference DTM boundary.

Centerline: shows the current station and offset information for the rod location relative to the centerline selected from the previous screen. The type of line segment in the polyline or alignment at the current station is also displayed. (This card is only available if the With Centerline checkbox was checked in the first Stake DTM screen.)



Note: Tapping anywhere within the map view will open a larger map view with zoom controls.

Point: is the point name that will be assigned to the next stored stake point.

Desc: is the description that will be assigned to the next stored stake point.

HR: is the height of the rod.

▼: opens the Smart Target options (Page R-449).

EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

Take Shot...: triggers the total station to take a shot to the prism.

View...: opens the 3D View screen (Page R-85) where a 3D view of the non-reference DTM surface can be viewed from any angle as well as cut/fill volume information between two selected surfaces.

Note: The View... button is only available when Generate DTM with Staked Points is checked in the first Stake DTM screen and at least three stake points have been stored that do not lie on a straight line.

< Back: returns to the first Stake DTM screen.

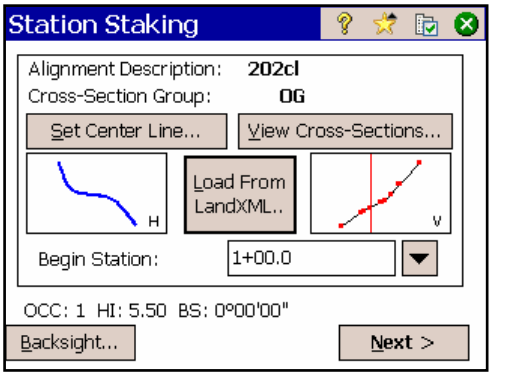
Store: will store a stake point for the last point that was shot using the point name shown in the Point field and the description in the Desc field. (A new shot is not taken from this button.) The Point field is then advanced to the next available point name.

Station Staking

Stakeout | Station Staking

The Station Staking routine allows you to stake the stations, offsets, and surfaces built into a LandXML file.

The first Station Staking screen is used to load a LandXML file and view the details of that file.



The box on the left displays the horizontal view of the centerline include within the LandXML file and the box on the right shows the vertical view.

Set Center Line...: allows you to select any polyline or alignment in the current job to use as a centerline. This will replace any centerline loaded from the LandXML file.

View Cross-Sections...: opens the Cross-Section View screen, described below, where you can view the station, surface, and offset details of the loaded LandXML file.

Load From LandXML...: opens the Open screen (Page R-13) where you can select which LandXML file to load.

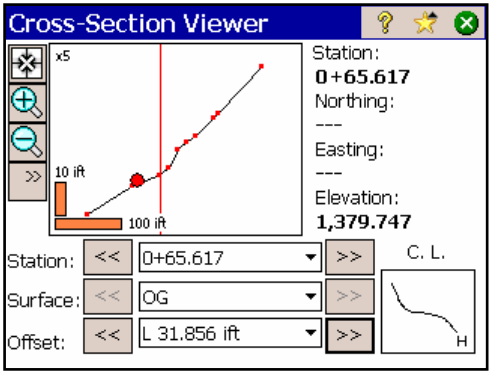
Backsight...: opens the Backsight Setup screen (Page R-118) where you can set your backsight.

Next >: opens the next Station Staking screen.

Cross-Section View

Stakeout | Station Staking | View Cross-Sections

The Cross-Section View screen is used to view the station, surface, and offset details of the loaded LandXML file.



The upper portion of the screen lists the Station, Northing, Easting, and Elevation at the selected node.

The larger graphic area displays the cross-sectional view of the selected surface. The smaller graphic area displays the horizontal view of the centerline.

Zoom Extents: will zoom so the entire cross section will fit inside the frame.

Zoom In Button: will zoom the current screen in by approximately 25%.

Zoom Out Button: will zoom the current screen out by approximately 25%.

»: expands a list where you can select to zoom to a window, zoom up vertically, or zoom down vertically.

Stations: allows you to scroll through and view all the stations in the LandXML file.

Surfaces: allows you to scroll through and view all the surfaces in the LandXML file.

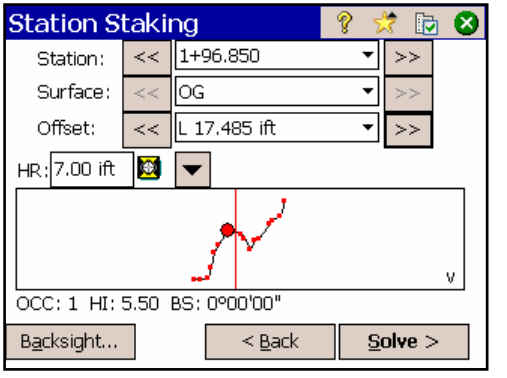
Offset: allows you to scroll through and view the details of the node at the selected offset.

Tap to exit from this screen.

Station Staking – Screen Two

Stakeout | Station Staking | Next >

The second Station Staking screen is used to configure which Station, Surface, and Offset you want to stake.



Use the corresponding << and >> buttons to scroll the available Station, Surface, and Offset that you want to stake.

Height of Rod: is the rod height.

Backsight...: opens the Backsight Setup screen (Page R-118) where you can set your backsight.

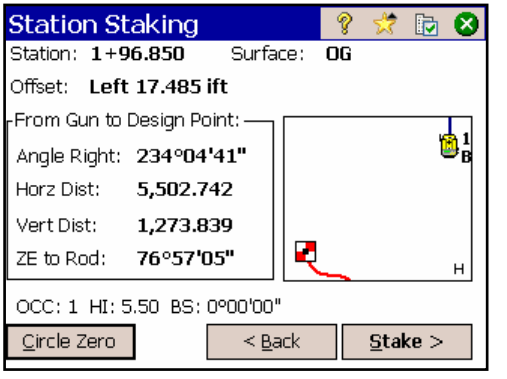
< Back: returns to the previous screen.

Solve >: opens the next Station Staking screen.

Station Staking – Screen Three

Stakeout | Station Staking | Next > | Solve >

The third Station Staking screen shows the direction and distance information from the instrument to the selected stake point.



The Station, Surface, and Offset information is displayed at the top of the screen.

From Gun to Design Point: lists the direction and distance information used to aim the total station toward the stake point.

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing toward the design point, which can sometimes be easier than turning to an obscure angle value. When this button is tapped, the following actions will occur:

1. A new backsight circle value is computed, sent to the instrument and stored in the raw data
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the design point.
3. To prevent errors, the backsight set up is invalidated when exiting the Stakeout dialog if this button has been used. A circle zeroed on a design point is meaningless once the design point has been staked.
4. The first time Circle Zero is used during a stakeout session, a dialog will appear to warn that the original backsight reference will be lost.

Note: The Circle Zero button is not available when using a robotic total station.

< Back: returns to the previous screen.

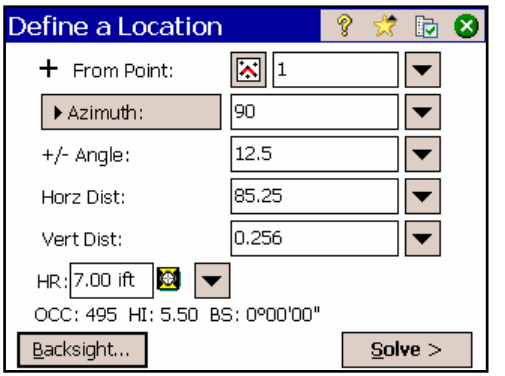
Stake >: opens the final Station Staking screen used to perform the shots to stakeout the point. This is identical to the third Stake Points screen described on Page R-276.

Define a Location

Stakeout | Define a Location

The Define a Location screen is used to manually enter the distance and direction to a new point from any existing reference point and then stakeout the new point.

From Point: is the reference point that the specified angle and distance information is applied to for locating the new point.



Azimuth / Bearing: is the direction from the reference point to the new point.

+/- Angle: is the angle to be added to the specified azimuth or bearing, thus modifying the direction to the new point.

Note: To subtract an angle from the specified azimuth or bearing, enter a negative +/- Angle value.

Horiz. Dist: is the horizontal distance from the reference point to the new point.

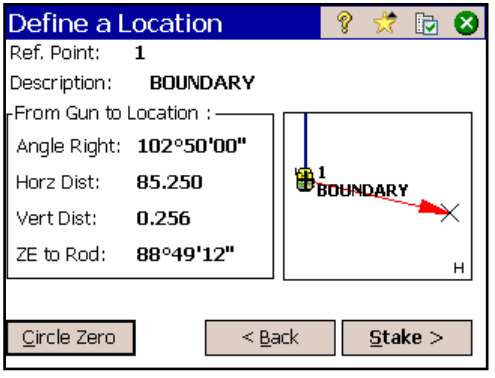
Vert. Dist: is the vertical distance from the reference point to the new point.

Store point: When this is checked, the computed point will be stored with the name specified here.

Solve: will compute the location for the new point and access the next screen.

Define a Location – Screen Two

The second Define a Location screen displays the direction and distance information from the occupy point to the new point.



Ref. Point: is the reference point specified in the From Point field in the previous screen.

Description: is the description for the reference point.

From Gun to Location: displays the angle and distance information from the total station to the new point. Users would aim their non-robotic total station the direction specified here.

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing toward the design point, which can sometimes be easier than turning to an obscure angle value. When this button is tapped, the following actions will occur:

1. A new backsight circle value is computed, sent to the instrument and stored in the raw data
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the design point.
3. To prevent errors, the backsight set up is invalidated when exiting the Stakeout dialog if this button has been used. A Circle zeroed on a design point is meaningless once the design point has been staked.

Note: The Circle Zero button is not available when using a robotic total station.

< Back: returns to the previous screen.

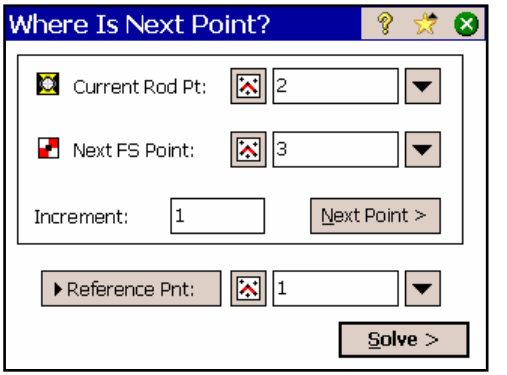
Stake >: opens the third Define a Location screen where the new point can be staked out.

Note: The third Define a Location screen is identical to the third Stake Points screen, which is described on Page R-276.

Where is Next Point

Stakeout | Where Is Next Point

The Where is Next Point screen is used to assist the rod person in locating another point, given the current rod point, a reference point, and the point to locate.



Current Rod Pt: is the current rod point.

Next FS Point: is the point that the rod person wants to locate.

Increment: is added to the Next FS Point value after pressing the Next Point > button. (A negative integer can be entered to have point numbers advance in descending order.)

Next Point >: advances the Next FS Point value by the specified Increment, replaces the current rod point by the previous FS point, and opens Screen Two.

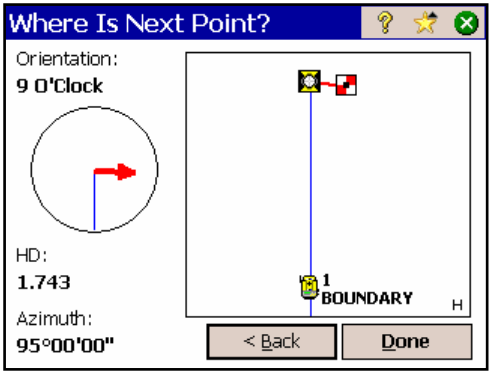
Note: If the Next FS Point does not exist and the Increment value=1, pressing the Next Point button will access the next existing point. If the Increment is greater than one and the next point does not exist, a warning is displayed.

▸ Reference Point / ▸ Reference Azm: is the reference point / azimuth used to determine the direction to the Next FS Point.

Solve >: computes the direction and distance to the Next FS Point and opens the second screen.

Where is Next Point – Screen Two

This screen shows two graphics that indicate the direction and distance that the rod person must travel to reach the Next FS Point.



The clock-style graphic shows the current rod location at the center, a line in the 12 o'clock position indicates the direction to the Reference, and an arrow shows the direction to the Next FS Point. There is also a text indicator that explains the direction to travel in a clock format.

The second graphic is a map view that shows the Current Rod Point, the Reference and the Next FS Point. It also shows the Occupy Point if the backsight has been set.

The lower left portion of the screen displays the azimuth from the rod to the Next FS Point and the horizontal distance between them.

< Back: returns you to the first screen.

Done: closes the screen.

Stakeout Menu – GPS and Basic GPS

The Stakeout Menu while running in GPS mode with either the GPS module or Basic GPS module contain the routines used to stake existing points and other known locations.

Items shown in gray utilize the GPS Staking screen described on the following page and are otherwise identical to the conventional stakeout routines described starting on Page R-273.

A: Stake Points

B: Stake List of Points

C: Stake to Line

D: Offset Staking

E: Slope Staking

F: Line and Offset

G: Curve and Offset

H: Spiral and Offset

I: Show Station

J: Store Offset Points

K: Stake DTM

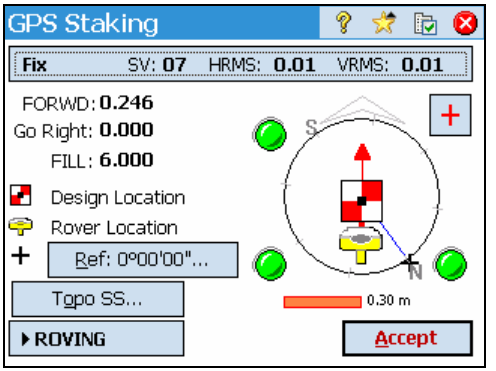
L: Where is Next Point

Stake Points

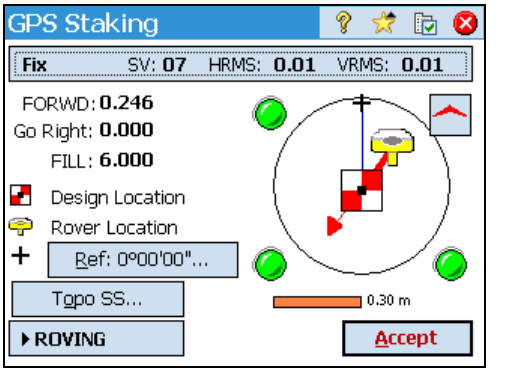
Stakeout | Stake Points

The GPS Staking screen is used to navigate to a design point with the receiver in roving mode. Once the design point has been staked, this screen is also used to control static occupations for the most precise measurement to the as built point.

The first two screens of this routine are similar to the conventional method, except that the Backsight button on the first screen and the Circle Zero button on the second screen are replaced with a Setup HR button to configure rover antenna. The backsight information is replaced with rover antenna height information. See Page R-274 for comparison.



Roving using navigation method

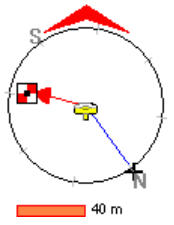


Roving using + navigation method

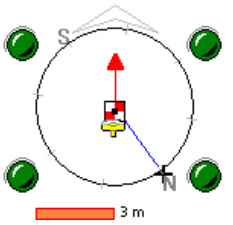
There are two navigation methods available when staking a point and you can switch between them by tapping the / + button.

When using the method, a large red arrow indicates the direction of travel and always appears at the top of the graphic. This arrow will dim when at a standstill or when near the design point. A north and south indicator are displayed on the graphic and will rotate depending on your direction of travel along with a blue line that indicates the direction to your reference point or azimuth. When you are near the design point, the graphic will change and the N/S

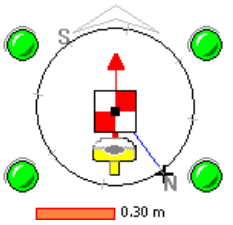
indicator will stop updating to assist you in more precisely locating the design point as illustrated below.



Rover is greater than 3 m (10 ft) from the design point.



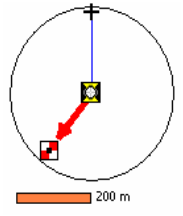
Rover is between 0.3 and 3 m (1 and 10 ft), from the design point.



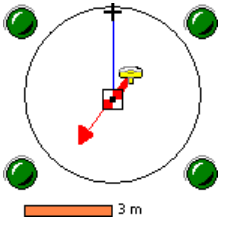
Rover is within 0.3 m (1 ft) of the design point.

Rover is within the horizontal tolerance specified in the stakeout settings

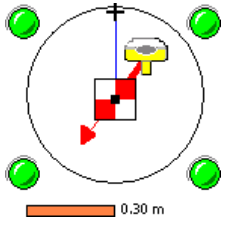
When using the + method, your reference point or azimuth will always appear at the top of the screen and that is the direction you should be facing while navigating. Like with the other navigation method, the graphic will change as you get closer to the design point. Each graphic is shown below.



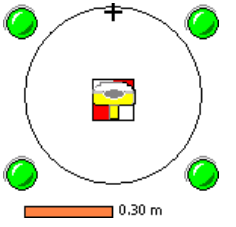
Rover is greater than 3 m (10 ft) from the design point.



Rover is between 0.3 and 3 m (1 and 10 ft), from the design point.



Rover is within 0.3 m (1 ft) of the design point.



Rover is within the horizontal tolerance specified in the stakeout settings

GPS Status: displays the current solution type, the number of satellites used, and the horizontal and vertical precision computed by the receiver. When this area of the screen is tapped, the epoch count stops and the GPS Status screen opens (Page R-172).

Go SOUTH / NORTH: displays the distance the rover must move in a south or north direction to reach the design point.

Go EAST / WEST: displays the distance the rover must move in an east or west direction to reach the design point.

Note: The Display Directions As field in the Stakeout Settings screen configures the format for the text that directs you to the design point.

CUT / **FILL**: displays the required cut or fill between the current elevation and the design point.

Ref: 0°00'00"...: opens a screen where you can select a reference azimuth or point, which will then be displayed on the navigation graphic as a blue line to assist in orienting yourself. When Auto Snap to Reference When Close is checked in this screen and when using the navigation method, the navigation method will automatically switch to the + method when you are within 3 meters of the design point. (Checking this box while in using the + navigation method has no effect.)

▸ OCCUPYING / ▸ ROVING: switches from ROVING to OCCUPYING mode. When ROVING, the receiver is in dynamic mode and will calculate your position as you move to the point. When OCCUPYING, the receiver is switched to static mode (depending on settings) and will calculate the most precise position for the staked point.

Topo SS: allows you to store a side shot measurement during stake out.

Accept: opens the third and final Stake Points screen where the current stake point can be staked and optionally stored. When post-processing and in Occupying mode, this button will be labeled Store and will signal the end of the occupation and store the point.

Stake to Line

Stakeout Stake to Line

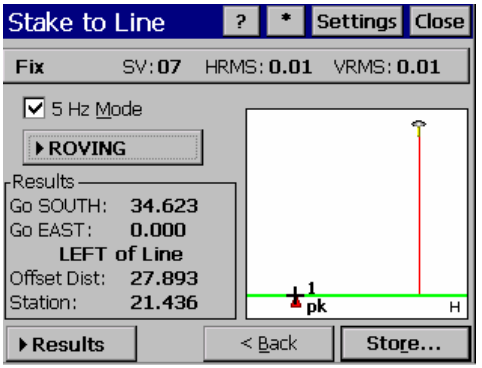
The Stake to Line screen allows you to locate points on a continuous predefined line. Direction information is provided to locate the line by traveling the shortest possible distance (a perpendicular offset to the line) between the rover and the line.

The first screen of this routine is similar to the conventional method except that the Backsight button is replaced with a Setup HR button

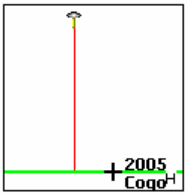
to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-282 for details.

Stake to Line – Screen Two

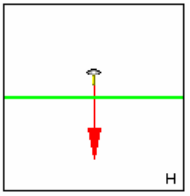
The second screen is where measurements take place and the staking directions are displayed. The graphic and display direct you to points on line via the shortest route, a perpendicular offset from the rover to the line.



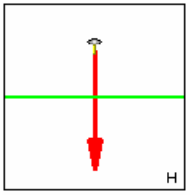
The graphic display will change depending on how close you are to the specified line. The chart below illustrates each screen type.



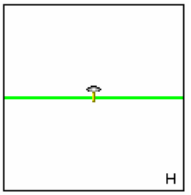
Rover is greater than 3 m (10 ft) from the line.



Rover is between 0.3 and 3 m (1 and 10 ft) from the line.



Rover is within 0.3 m (1 ft) of the line



Rover is on the line or within the Horizontal Distance Tolerance specified in the Stakeout Settings screen.

Note: Tap the graphic portion of the screen for an expanded view.

GPS Status: displays the current solution type, the number of satellites used, and the horizontal and vertical precision computed by

the receiver. If this area of the screen is tapped, the epoch count stops and the GPS Status screen opens (Page R-172).

Go SOUTH / **NORTH**: displays the distance the rover must move in a south or north direction to reach the closest point on the line.

Go EAST / **WEST**: displays the distance the rover must move in an east or west direction to reach the closest point on the line.

▸ OCCUPYING / ▸ ROVING: switches from ROVING to OCCUPYING mode. When ROVING, the receiver is in dynamic mode and will calculate your position as you move to the point. When OCCUPYING, the receiver is switched to static mode (depending on settings) and will calculate the most precise position for the staked point.

Results / **Current Location**: displays either the directions to the closest point on the line or the current local coordinate.

LEFT of Line / **RIGHT of Line** / **ON LINE**: displays the position of the rover with respect to the line. Left and right are relative to north. ON LINE is displayed when you are within the Horizontal Distance Tolerance specified in the Stakeout Settings screen (Page R-47).

Offset Dist.: displays the perpendicular offset distance from the line to the rover.

Station: displays the station on the line associated with the offset location. It is relative to the Start Point defined in the first screen.

▸ Results / ▸ (N,E,Z): toggles the display between Results and Current Location.

Store: prompts you for a point name and description and stores a point for the current location.

Slope Staking

Stakeout | Slope Staking

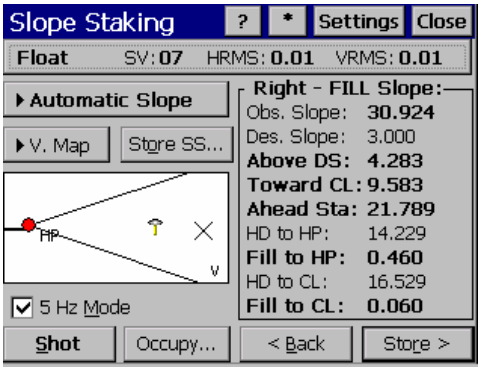
The Slope Staking screen is used to locate the catch points for a roadway in any terrain.

The first screens of this routine are similar to the conventional method except that the Backsight and Circle Zero buttons are replaced with a Setup HR button to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-293 for details.

Once the centerline of the road is selected and the road profile is defined, the fourth Slope Staking screen is used to locate the stake point at the current station.

Slope Staking – Screen Four

The graphic portion of the Horizontal Map and Vertical Map is updated continuously. This allows the user at the rover position to watch the movement of the rover in relation to the slope and easily position the rod over the catch point.



Note: You can tap in the graphic portion of the screen to open the graphic in a larger window.

Although the graphic portion of the screen is continuously updated, the numeric values are not updated until the Shot button is tapped. The correct procedure for slope staking in GPS mode is to use the graphic portion of the screen to locate the catch point as closely as possible and press Shot. Once the position is satisfactory, you can determine if the rover needs to be moved again.

GPS Status: displays the current solution type, the number of satellites used, and the horizontal and vertical precision computed by

the receiver. Tap on this button to open the detailed GPS Status screen (Page R-172).

The first button selects the type of slope that will be used between the catch point and hinge point from the following options:

- ▸ Automatic Slope: selects the slope based on the current rover position. If the rover is above the hinge point, a cut slope is computed. If the rover is below the hinge point, a fill slope is computed.
- ▸ Force CUT Slope: forces all computations to be based on a cut slope.
- ▸ Force FILL Slope: forces all computations to be based on a fill slope.

The second button selects which information is displayed in the lower corner of the screen from the following options:

- ▸ V. Map: displays a cross-sectional view at the current station.

Note: When you tap a map view, an expanded view of the same map will fill the screen.
Note: The Vertical Map will show an X at the location of each previous shot. This can be useful in determining if the current terrain will never intersect the slope (no catch point).

- ▸ H. Map: displays an overhead view of the job.
- ▸ N,E,Z: displays the coordinates computed from the last shot.

Occupy...: switches the receiver dynamics to static (depending on settings) and opens the Occupy Data Points screen (Page R-194) where data can be collected for the current point.

Side Shot: allows you to store a side shot measurement during stake out. This button opens a prompt for the side shot point name and opens the GPS Occupy Data Points screen. After you store the new point (or cancel) you will resume with the Slope Staking screen.

Results: displays the results computed from the last Shot.

Obs. Slope: is the computed (observed) cut or fill slope based on the last shot and the corresponding hinge point.

Des. Slope: is the design cut or fill slope.

Cut / Fill: is the cut or fill required for the current rover location to be positioned on the design slope.

Toward CL / Away CL: is the computed horizontal distance that the rod must move either toward the centerline or away from it, respectively, before it is positioned at the catch point.

Note: The computed horizontal distance is based on the observed terrain computed from the last two shots. If only one shot has been taken, it is assumed that the terrain is level when computing this value.

On Station / **Back Sta** / **Ahead Sta**: informs you if the rod is on the station being staked, or the distance it must move (parallel to the centerline) back or ahead to be on the correct station.

HD to HP: is the horizontal distance from the rod to the hinge point.

VD to HP: is the vertical distance from the rod to the hinge point.

HD to CL: is the horizontal distance from the rod to the centerline.

VD to CL: is the vertical distance from the rod to the centerline.

Line and Offset

Stakeout | Line and Offset

The instructions for the Line and Offset routine for GPS similar to the conventional method, except that the Backsight and Circle Zero buttons are replaced with a Setup HR button to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-303 for details.

Curve and Offset

Stakeout | Curve and Offset

The instructions for the Curve and Offset routine for GPS are similar to the conventional method, except that the Backsight and Circle Zero buttons are replaced with a Setup HR button to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-306 for details.

Spiral and Offset

Stakeout | Spiral and Offset

The instructions for the Spiral and Offset routine for GPS are similar to the conventional method, except that the Backsight and Circle Zero buttons are replaced with a Setup HR button to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-310 for details.

Show Station and Offset

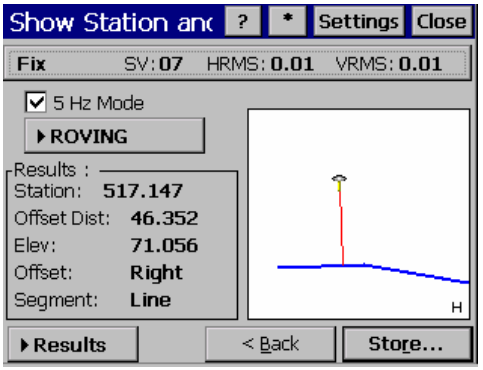
Stakeout | Show Station

The Show Station and Offset routine allows you to position the rover anywhere near a polyline, a range of points that define a line, or an alignment to see where the rod is located in relation to the selected line.

The first screen of this routine is similar to the conventional method, except that the Backsight button is replaced with a Setup HR button to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-314 for details.

Show Station – Screen Two

Once the line is selected, the second screen is opened where information is displayed about the rod position and the selected line.



GPS Status: displays the current solution type, the number of satellites used, and the horizontal and vertical precision computed by the receiver. Tap on this button to open the detailed GPS Status screen (Page R-172).

OCCUPYING / ROVING: switches from ROVING to OCCUPYING mode. When ROVING, the receiver is in dynamic mode and will calculate your position as you move to the point. When OCCUPYING, the receiver is switched to static mode (depending on settings) and will calculate the most precise position for the staked point.

Results / N,E,Z: displays either the results, or plane coordinates in the lower corner of the screen.

Station: is the station at the current rod position.

Offset Dist: is the perpendicular distance from the line to the rod.

Elev: is the elevation at the rod position.

Offset: displays if the rod is on the Left or Right of the line.

Segment: displays the type of line segment at the current station.

< Back: returns to the previous screen.

Store : stores a point for the current rod location.

Store Offset Points

Stakeout | Store Offset Points

The instructions for the Store Offset Points routine for GPS are similar to the conventional method, except that the Backsight button is replaced with a Setup HR button to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-316 for details.

Stake DTM

Stakeout | Stake DTM

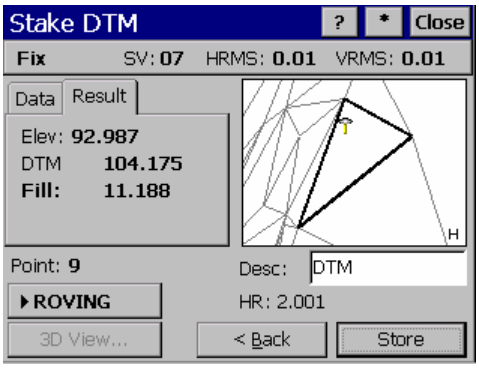
The Stake DTM routine allows you to stake an area and get cut / fill and volume information based on a reference DTM or specified elevation datum.

The first screen of this routine is similar to the conventional method, except that the Backsight button is replaced with a Setup HR button to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-319 for details.

DTM GPS Shot

Stakeout | Stake DTM | Solve

The DTM GPS Shot screen displays all relevant information on the current rover position and a graphic that shows the rover location, the occupied TIN triangle, and the rectangular DTM corners of the DTM boundary.



Note: the DTM boundary corners and TIN triangle may not be visible depending on the current scale of the screen.

▸ OCCUPYING / ▸ ROVING: switches from ROVING to OCCUPYING mode. When ROVING, the receiver is in dynamic mode and will calculate your position as you move to the point. When OCCUPYING, the receiver is switched to static mode (depending on settings) and will calculate the most precise position for the staked point.

3D View... : opens the 3D View screen (consult the conventional surveying Reference manual) where a 3D view of the DTM can be viewed from any angle as well as cut / fill information for the current location.

Note: The 3D View... button is only available when Generate TIN w\Staked Points is checked in the previous screen and at least three stake points have been stored.

Store : stores a point at the current rover location with the point name shown in the St Pt field and the description in the Desc field. Also advances the St Pt to the next available point name.

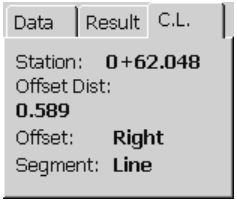
St Pt: is the point name that will be assigned to the next stored point.

Desc: is the description that will be assigned to the next stored point.

HR: is the height of the rod.

Data: shows the northing, easting, and elevation of the current rover location.

Result: shows the computed elevation of the DTM at the current location and the cut or fill necessary to bring the elevation at the current location to the elevation of the DTM at the current location.



C.L.: shows the current station and offset information for the rover location relative to the selected centerline. The type of line segment in the polyline at the current station is also displayed. (This card is only available if the With C.L. checkbox was checked in the previous screen.)

Note: Tapping anywhere within the map view will open a larger map view, which provides zoom controls.

Where is Next Point

Stakeout | Where is Next Point

The instructions for the Where is Next Point routine for GPS are similar to the conventional method, except that the Backsight button is replaced with a Setup HR button to configure rover antenna and the backsight information is replaced with rover antenna height information. See Page R-330 for details.

Inverse Menu

The Inverse Menu contains routines that compute the direction and distance between two objects. The following screens are available from the Inverse Menu:

A: Inverse Point to Point

B: Inverse Point to Line

C: Inverse Point to Polyline

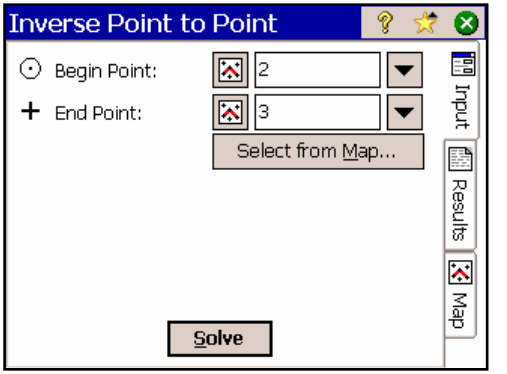
D: Inverse Point to Multiple Points

E: Inverse Point to Location / Point

Inverse Point to Point

Inverse | Point to Point

The Inverse Point to Point screen will calculate the distance and direction between two existing points.



Begin Point: is the reference point used to compute the distance and direction to the End Point.

End Point: is the point whose relationship to the Begin Point is computed.

Select from Map...: allows you to quickly select both the Begin Point and End Point from a map view. The first point tapped is entered as the Begin Point and the second as the End Point.

Solve: will compute the distance and direction from the Begin Point to the End Point.

Results

Azimuth: is the azimuth from the Begin Point to the End Point.

Horz Dist: The horizontal distance from the Begin Point to the End Point.

Vert Dist: The vertical distance from the Begin Point to the End Point.

Slope Dist: is the slope distance from the Begin Point to the End Point.

North: The change in the Y-coordinate from the Begin Point to the End Point.

East: The change in the X-coordinate from the Begin Point to the End Point.

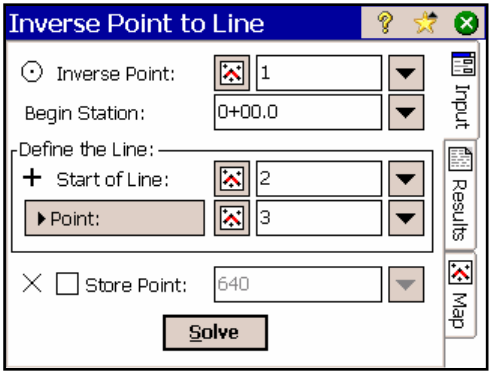
Elevation: The change in elevation from the Begin Point to the End Point.

Grade: is the slope from the Begin Point to the End Point.

Inverse Point to Line

Inverse | Point to Line

The Inverse Point to Line screen computes the perpendicular offset distance and direction from a known point to a continuous line defined by two points or one point and a direction.



Inverse Point: is the known point that the offset information to a specified line is computed.

Begin Station: is the beginning station value that corresponds with the Start of Line, which is used to compute the inverse station in the results.

Start of Line: is the first point that defines the line from which the offset is computed.

Point / Direction: is the second point or known direction that defines the line from which the offset is computed.

☑ **Store Point**: When checked, will store the coordinates for the point located on the specified line, tangent to the offset.

Solve: will compute the distance and direction of the offset from the known point perpendicular to the specified line.

Results

Inv. Station: is the station on the specified line where the perpendicular offset occurs, starting from the Begin Station.

Offset: is the horizontal distance of the perpendicular offset between the Inverse point and specified line.

Offset is: indicates if the Inverse point is located to the Right, Left, or on the specified line as you occupy Point 1 and face the second point or direction of the line.

Azimuth (pt to line): is the azimuth of the offset from the Inverse point toward the specified line.

North: is the Y-coordinate on the specified line, tangent to the perpendicular offset.

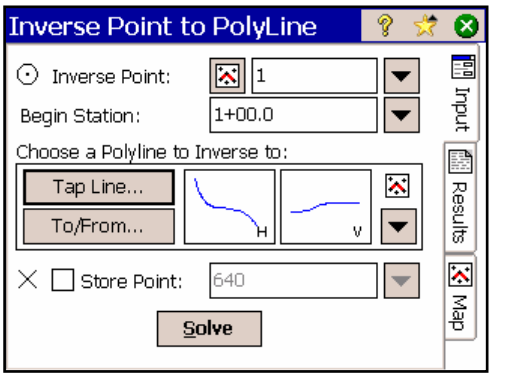
East: is the X-coordinate on the specified line, tangent to the perpendicular offset.

Elevation: is the elevation on the specified line, tangent to the perpendicular offset.

Inverse Point to Polyline

Inverse | Point to Polyline

The Inverse Point to Polyline screen computes the offset distance from a known point perpendicular to a polyline.



Inverse Point: is the known point that the offset to a polyline segment is computed.

Begin Station: is the starting station assigned to the beginning of the polyline, which is used to compute the Station in the results.

Tap Polyline: allows you to tap an existing polyline from a map view.

Editor: opens the Polyline Editor (Page R-65) where a new polyline can be created or an existing polyline can be modified.

Tap Points: provides a map view where you can tap any existing points to create a temporary polyline.

To/From: Opens the Point List screen (Page R-443) where a point list can be created.

☑ **Store Point**: When checked, will store the first solution where a perpendicular offset intersects with a polyline using the specified point name. If additional solutions are found, the following solutions will be stored using consecutive point names.

Solve: will compute the distance and direction of the offset from the known point perpendicular to the polyline.

Note: There is no solution if a perpendicular offset does not occur within the extents of any selected polyline segments.

Results

Station: is the station along the polyline where the offset occurs, starting from the Begin station.

Offset: is the horizontal distance of the offset.

Offset is: indicates if the Inverse Point is located to the right, left, or on the specified line as you occupy the beginning of the polyline and face the end.

Segment Type: shows if the segment is a line, arc, or spiral.

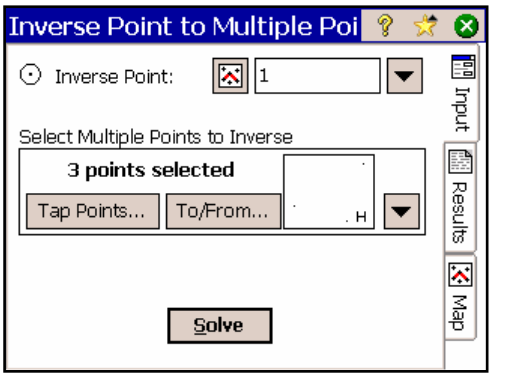
Beg. Pt: if applicable, this is the first point selected that defines a line.

End Pt: if applicable, this is the second point selected that defines a line.

Inverse Point to Multiple Points

Inverse | Multiple Points

The Inverse Point to Multiple Points screen will calculate the distance and direction from an existing point to one or more other points.



Inverse point: is the reference point used to compute the distance and direction to the other points.

Tap Points: provides a map view where you can tap multiple points.

To/From: Opens the Point List screen (Page R-443) where a point list can be created.

Solve: will compute the distance and direction from the Inverse point to all selected points.

Results

Azimuth: is the azimuth from the Inverse Point to the selected point.

Horz Dist: is the horizontal distance from the Inverse Point to the selected point.

Vert Dist: is the vertical distance from the Inverse Point to the selected point.

Slope Dist: is the slope distance from the Inverse Point to the selected point.

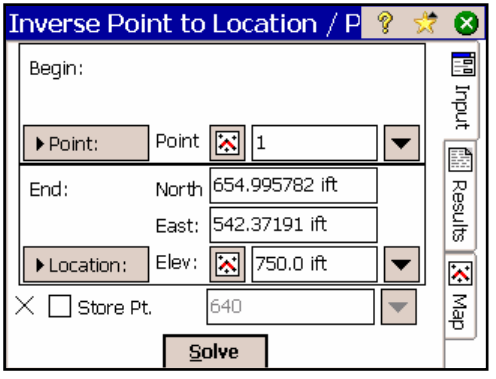
North: is the change in the Y-coordinate from the Inverse Point to the selected point.

East: is the change in the X-coordinate from the Inverse Point to the selected point.

Inverse Point to Location / Point

Inverse | Location / Point

The Inverse Point to Location / Point screen will calculate the distance and direction from any point or location to another point or location.



Begin: is the reference point or location used to compute the distance and direction to another point or location.

End: is the other point or location whose correlation to the Begin point or location is computed. Each location is defined by one of the following methods:

- Location: : when selected, the coordinates for any location can be entered in the appropriate fields.
- Point: : when selected, any existing point name can be entered in the appropriate field or selected from a map view.

☑ **Store Pt.**: When checked, will store a point for the location(s) entered.

Solve : will compute the distance and direction from the Begin point or location to the End point or location.

Cogo Menu

The Cogo Menu contains all of the coordinate geometry routines used to perform computations from the existing job data. The following screens are available from the Cogo Menu:

A: Point in Direction

B: Intersection

C: Offset Line

D: Offset Points

E: Station Offset

F: Corner Angle

G: Compute Area

H: Triangle Solutions

I: Map Check

J: Predetermined Area

K: HD/VD to SD/ZA

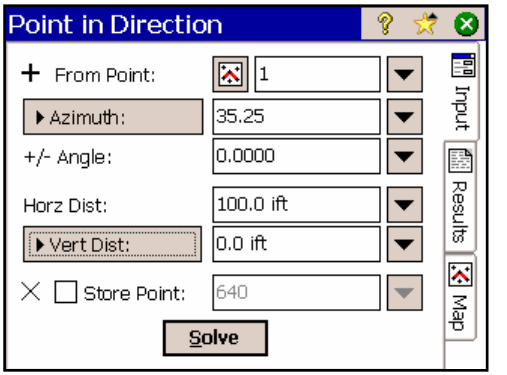
L: SD/ZA to HD/VD

M: AU Conversion

Point in Direction

Cogo | Point in Direction

The Point in Direction screen will calculate and store the position of a new point after providing a distance and direction from a known point.



From point: is the point name of the reference point used for locating the new point.

Azimuth / Bearing: is the direction from the reference point to the new point.

+ / - Angle: is the angle added to the Azimuth / Bearing to modify the direction to the new point.

Note: To subtract an angle from the specified azimuth or bearing, enter a negative +/- Angle value.

Horiz. Dist: is the horizontal distance from the reference point to the new point.

Vert. Dist: is the vertical distance from the reference point to the new point.

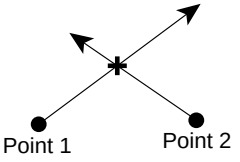
Store point: When this is checked, the computed point will be stored with the name specified here.

Solve: will compute the location for, and optionally store the new point.

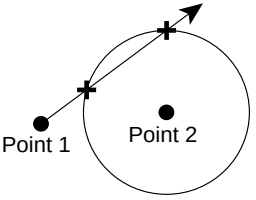
Intersection

Cogo | Intersection

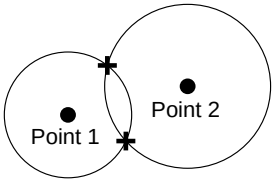
The Intersection screen computes the intersection(s) of two lines given the direction(s) and/or distance(s) from two existing points. (See illustration below.) Once solved, the intersection points can be viewed from the Map view and optionally stored.



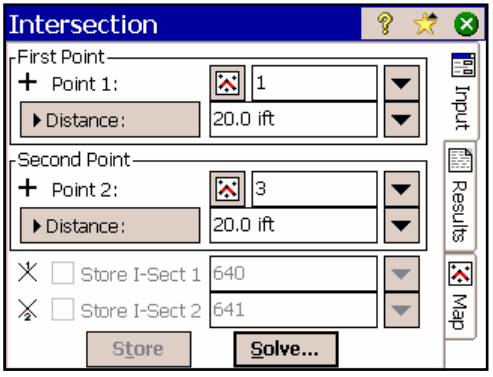
Direction - Direction Intersection



Direction - Distance Intersection



Distance - Distance Intersection



Point 1: is an existing point that locates the first line.

Point 2: is an existing point that locates the second line.

Distance / Azm or Brg: is the length or direction of the specific line tangent to the specified point.

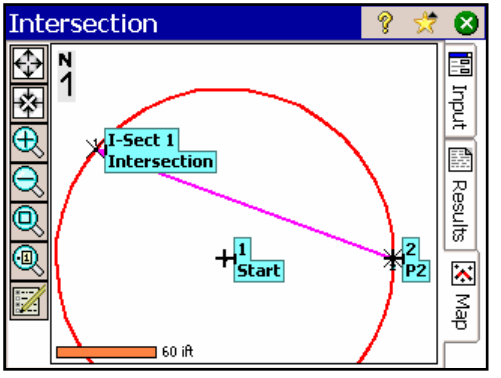
☑ **Store I-Sect 1/2**: These items are only available after solving the screen. Once solved, the computed intersections can be viewed from the Map card where you can decide which intersecting point(s) to store in the Input card.

Store: Stores the intersecting points checked above, which were computed after solving.

Solve: will compute the intersecting point(s) and open the Results card.

Map

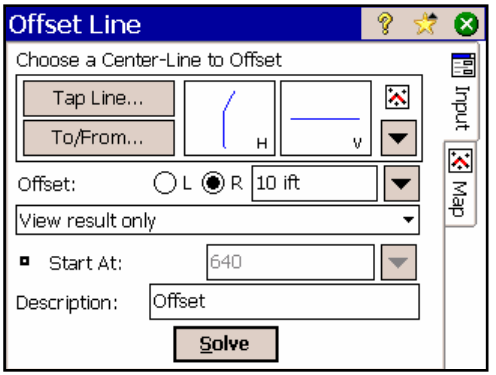
The Map card is used to determine which intersection points were computed and are labeled with a $\overset{1}{\times}$ and $\overset{2}{\times}$. You can then return to the Input card to select which of these points to store.



Offset Line

Cogo | Offset Line

The Offset Line screen is used to view, store a polyline, or store an alignment that is at a specified perpendicular offset to an existing set of points, a polyline, or an alignment.



Tap Line...: allows you to tap an existing polyline or alignment that the offset will be computed from.

To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Offset: defines the offset distance and which side the offset occurs. The right or left side is referenced from the first point that defines the specified line.

- **View result only**: allows you to view the resulting line in the Map view without saving anything.
- **Save to job as an alignment**: when checked, the computed offset line will be saved as a new alignment under the name specified in the Description field.
- **Save to job as a Polyline**: when checked, the computed offset line will be saved as a new polyline under the name specified in the Description field.

Note: Spiral curves cannot be generated in a new offset alignment. If the original centerline contains any spiral curves, they will be treated as straight sections in the offset alignment. The Offset Staking or Offset Points routine should be used to stake offsets from a spiral.

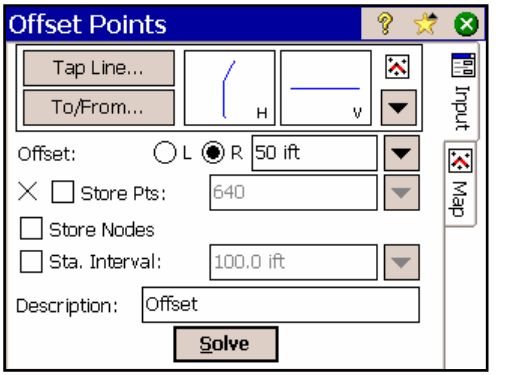
Description: is the description that will be given to the new alignment or polyline.

Solve: computes and optionally stores the new offset line.

Offset Points

Cogo | Offset Points

The Offset Points screen is used to store points at a specified perpendicular offset to an existing polyline, alignment, or point range. Points can be stored that correspond with the nodes of an alignment, points of a polyline, and/or at a specified station interval.



Tap Line...: allows you to tap an existing polyline or alignment that the offset points will be computed from.

To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Offset: defines the offset distance and which side the offset occurs. The right or left side is referenced from the first point that defines the selected line.

☑ **Store Pts**: When checked, will store the offset points that are computed based on the selected line and which of the two following checkboxes are checked.

Note: Leaving the Store Pts field unchecked and solving the screen will result in a map screen that displays the points that would be stored, but without actually storing anything to the job. This is useful for testing the routine before storing information.

☑ **Store Nodes**: When checked, computes offset points that correspond to each node in the selected alignment (points where the horizontal or vertical alignment change), or that correspond to the existing points in a selected line or point range.

☑ **Sta. Intervals**: When checked, computes offset points from the beginning of the selected line or point range, and at each specified station interval along the line or point range.

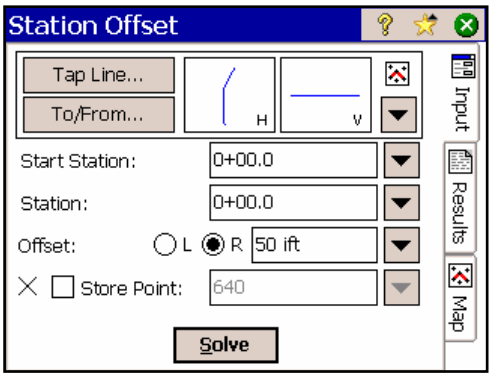
Description: is the description that will be assigned to all points that are stored.

Solve: computes the offset points, and stores them if the Store Pts checkbox is checked.

Station Offset

Cogo Station Offset

The Station Offset screen will compute and optionally store a point at a specified station and offset to an existing polyline or alignment. The elevation for the stored point will always be set to the elevation of the first node of the polyline, or alignment.



Start Station: is the station for the first node of the selected line.

Station: is the station on the line where you want to compute an offset point from.

Offset: is the offset distance that is to the left (when ◉ L is selected) or right (when ◉ R is selected) from the selected line.

☑ **Store Pts**: When checked, will store the computed offset point with the name specified in the corresponding field.

Tap Line...: opens a window where any polyline or alignment in the current job can be selected.

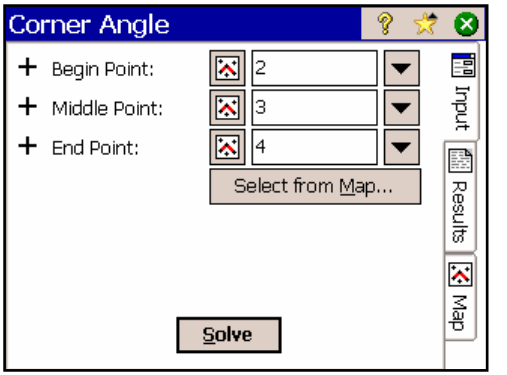
To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Solve: computes the location of the offset point and optionally stores the point.

Corner Angle

Cogo | Corner Angle

The Corner Angle screen provides information on the horizontal angle created from three known points.



Backsight: is an end point of the angle to be solved.

Middle Point: is the corner point of the angle to be solved.

Foresight Point: is the other end point of the angle to be solved

Select from Map...: Allows you to quickly select all of the above points from a map view. The first point tapped is entered in the Backsight field, the second in the Middle Point field and the third point tapped is entered in the End Point field.

Solve: will compute the following results that describe the angle defined by the three points provided.

Results

Angle left: is the horizontal angle created as you occupy the Middle Point, face the Backsight, and turn counterclockwise to the Foresight Point.

Angle right: is the horizontal angle created as you occupy the Middle Point, face the Backsight, and turn clockwise to the Foresight Point.

180 – right: is the angle that results from subtracting the angle right value from 180°.

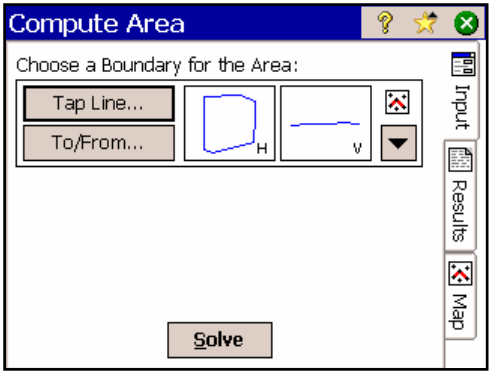
HD to Beg.: is the horizontal distance between the Backsight and the Middle Point.

HD to End: is the horizontal distance between the Foresight Point and the Middle Point.

Compute Area

Cogo | Compute Area

Allows you to compute the area of a selected boundary.



Tap Line... : allows you to tap an existing polyline from a map view.

To/From... : Opens the Point List screen (Page R-443) where a point list can be created.

Solve : will compute the area of the selected boundary.

Results

Area: is the area that the boundary encloses. If the boundary is not closed, the area is computed as if a line joined the two ends.

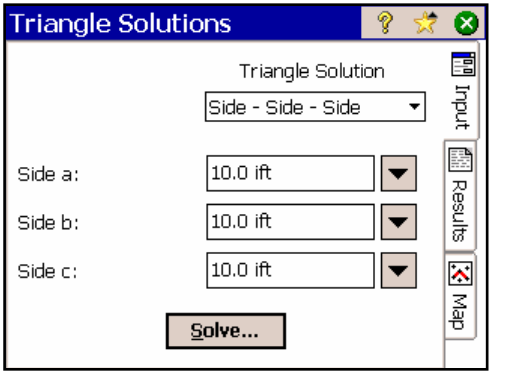
Length: is the length of the selected boundary.

Perimeter: is the length of the selected boundary, plus any additional length between the two ends of an open boundary.

Triangle Solutions

Cogo | Triangle Solutions

The Triangle Solutions screen will solve for the unknown parts of a triangle after providing three known parts.



Triangle Solution: is where you select the parts of the triangle that are known. You can select any of the following from the dropdown list:

- **Side-Side-Side**: The lengths of all three sides are known.
- **Angle-Side-Angle**: Two angles and the side between them are known.
- **Side-Angle-Angle**: Two angles and one side (that does not lie between those angles) are known.
- **Side-Angle-Side**: Two sides and the angle between them are known.
- **Side-Side-Angle**: Two sides and one angle (that is not between those sides) are known.

Solve... will solve for the unknown parts of the triangle.

Results

Side a / **b** / **c**: displays the length of each side.

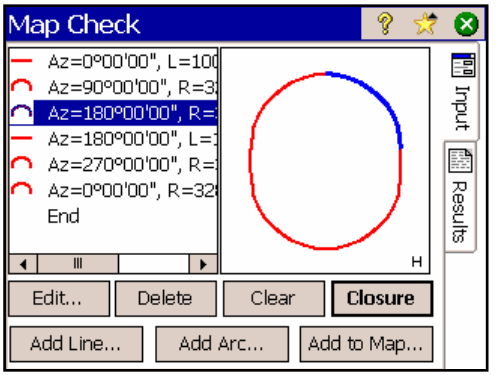
Angle A / **B** / **C**: displays the corresponding angle.

Area: displays the area of the triangle in square feet and acres, or in square meters and hectares.

Map Check

Cogo | Map Check

The Map Check screen is used to manually enter boundaries from a map to check for closure and other information related to the boundary.



Edit...: opens the appropriate editor screen where you can edit the selected line or curve from the list.

Delete: deletes the selected line segment.

Clear: clears all line entries.

Closure: opens the Results page.

Add Line...: opens the Add / Edit Line screen, (Page R-368), where a new line can be added prior to the select segment.

Add Arc...: opens the Add / Edit Curve screen (Page R-368) where a new curve can be added prior to the selected segment.

Add to Map...: opens the Add to Map screen (Page R-369) where the map data entered in the list can be added to the current job as a polyline.

Results

Area: is the area that the boundary encloses. If the start and end points are in different locations, the area is computed as if a line joined these two points.

Length: is the length of the boundary from the first point to the last point.

Perimeter: is the length of the boundary from the first point to the last point, plus any additional length between the last point and the first point.

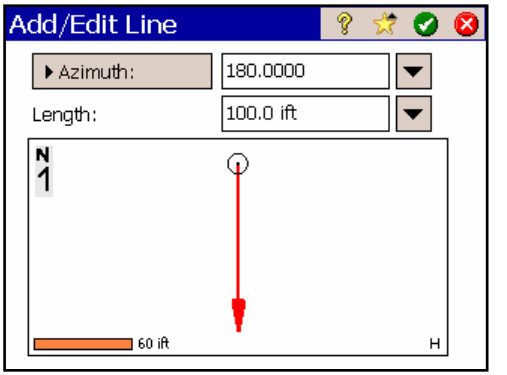
Error dist.: is the distance between the last point and the first point.

Error azm: is the direction from the last point to the first point

Precision: is the ratio between the Error distance and Perimeter.

Add / Edit Line

The Add / Edit Line screen is used to enter a new line to the list prior to the selected line segment.



Azimuth / Bearing: is the direction of the line.

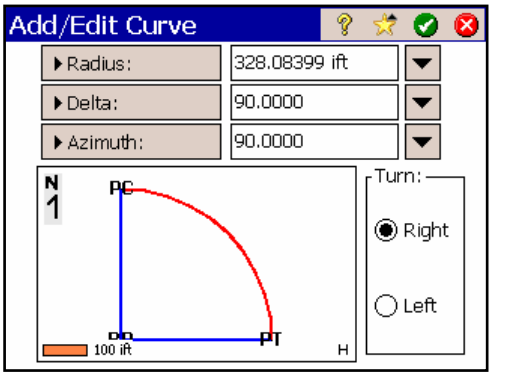
Length: is the length of the line, in feet or meters.

: enters the line to the list.

: closes the screen without entering any new line data.

Add / Edit Curve

The Add / Edit Curve screen is used to enter a new curve to the list prior to the selected line segment.



Radius: The distance from the radius point to the curve

Delta: The internal angle from center to tangent points

Degree Arc: The internal angle equivalent to a 100-ft arc length

Degree Chord: The internal angle equivalent to a 100-ft chord length

Length: The arc length

Chord : The chord length

Tangent: The distance from the PC or PT to the PI

Mid Ordinate: The distance between the curve and the chord at the center of the curve's length.

External: The minimum distance between the PI and the curve.

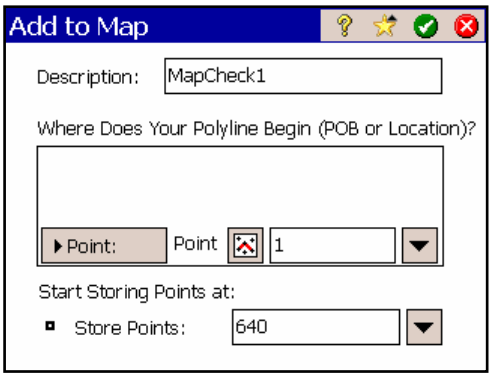
Azimuth / Bearing: defines the direction of the curve, tangent at the PC.

Turn: defines if the curve turns to the Left or Right while viewing the curve from the PC Point.

: appends the curve to the list.

Add to Map

The Add to Map screen is used to add the existing line and curve data to the current job as a polyline.



Description: is the name that will be assigned to the new polyline that will be added to the project.

Location: can be used to manually enter the coordinates for the first point of the polyline.

Point: can be used to define the starting location of the first point of the polyline by an existing point.

Store Points: is the first point name that will be used for the new points that are needed to add the figure to the current job. All additional points will be incremented from this point.

: adds the figure to the job at the specified location.

: closes the screen without adding any new data to the job.

Predetermined Area

Cogo | Predetermined Area

The Predetermined Area routine will take a boundary with one open side and compute the location of a line that will enclose the boundary with a specified area using the Hinge Method or the Parallel Method.

The Hinge Method computes the location of the side of a boundary that can pivot on a fixed point.

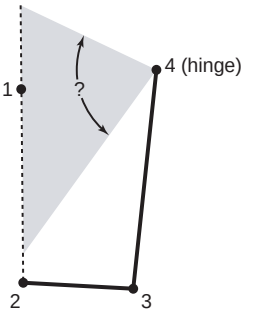
The Parallel Method computes the location of one side of a four-sided boundary where the computed side is parallel to a stationary side of the boundary.

The top-left field is used to enter the desired area of the specified boundary. In the next field, select the units entered from the dropdown list.

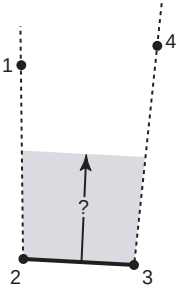
Hinge: solves the boundary using the Hinge Method when selected.

Parallel: solves the boundary using the Parallel Method when selected.

Tap Polyline...: allows you to tap an existing polyline from a map view to define the fixed sides of the boundary.

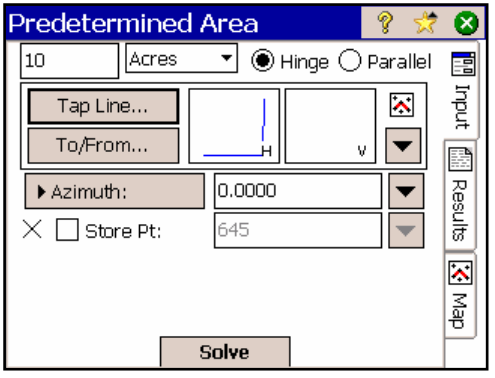


Hinge Method



Parallel Method

Note: a boundary has two fixed sides and one side defined by a direction when using the Hinge Method. It has one fixed side and two sides defined by a direction when using the Parallel Method.



Editor... : opens the Polyline Editor (Page R-65) where a new polyline can be created or an existing polyline can be modified.

Tap Points... : provides a map view where you can tap any existing points to define the fixed sides of the boundary.

To/From... : Opens the Point List screen (Page R-443) where a point list can be created.

☑ **Store Pt 1** / **2**: When checked, will store a point at the location of the end point(s) of the computed boundary line.

▸ Azimuth / ▸ Bearing: defines the direction of the boundary sides with lengths that are not yet known.

Results

Point 1 / **2**: Displays the coordinate of the end points of the computed boundary line.

Total Area: is the total area of the boundary.

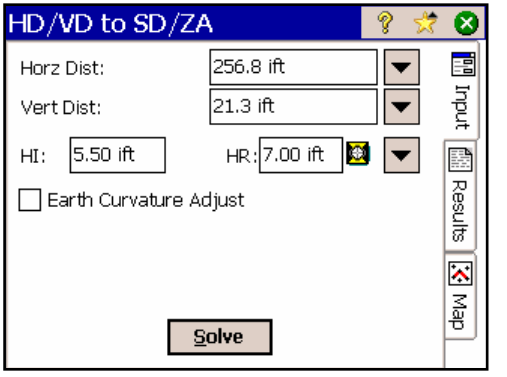
Plot Area: is the area enclosed by the pre-defined fixed boundary lines.

Difference: is the difference between the Total Area and the Plot Area.

HD/VD to SD/ZA

Cogo | HD/VD to SD/ZA

The HD/VD to SD/ZA screen will convert a vertical and horizontal distance to an equivalent slope distance and zenith angle.



Horz Dist: is the horizontal distance from the occupy point to the foresight point.

Vert Dist: is the vertical distance from the occupy point to the foresight point.

HI: is the distance that the total station is above the ground.

HR: is the length of the rod.

▼: opens the Smart Target options (Page R-449).

☑ **Earth Curvature Adjust**: When checked, the resulting zenith angle and slope distance will account for the curvature of the earth and refraction.

Solve: computes the equivalent slope distance and zenith angle from the data entered.

Results

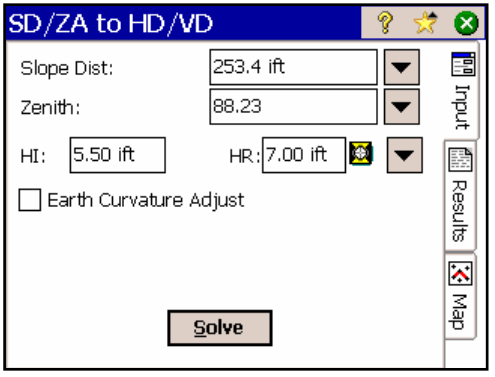
Zenith: is the computed zenith angle from the occupy point to the foresight point.

Slope Dist: is the computed slope distance from the occupy point to the foresight point.

SD/ZA to HD/VD

Cogo | SD/ZA to HD/VD

The SD/ZA to HD/VD screen will convert a slope distance and zenith angle to an equivalent horizontal distance and vertical distance.



Slope Dist: is the slope distance to be converted.

Zenith: is the zenith angle to be converted.

HI: is the distance that the total station is above the ground.

HR: is the length of the rod.

▼: opens the Smart Target options (Page R-449).

☑ **Earth Curvature Adjust**: When checked, the computed horizontal distance and vertical distance will account for the curvature of the earth and refraction.

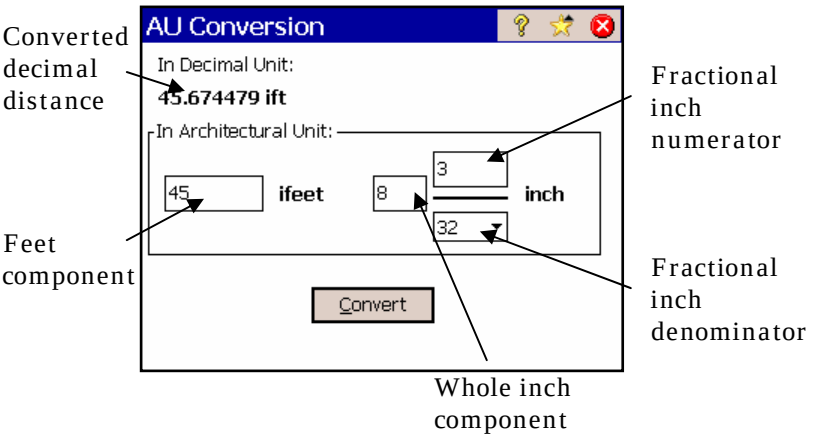
AU Conversion

Cogo | AU Conversion

The AU (Architectural Units) Conversion screen will convert distances with fractional inches to decimal distances.

If the job is configured for International Feet or US Survey Feet, it is assumed that the distance entered in this screen is in the same units as the job. If the job is configured for meters, it is assumed that the distance entered in this screen is in International Feet.

See Input Shortcuts in the User's Manual for more information on using architectural units.



Convert / Use: will perform the conversion. If this screen is accessed from the Quick Pick list when the cursor was in a distance field, this button will be labeled Use and will copy the converted distance to the corresponding distance field.

Curve Menu

The Curve Menu contains routines that will compute all aspects of a horizontal curve and assist in curve layout.

A: Curve Solution

B: PI and Tangents

C: 3-Point Curve

D: Radius Point

E: Tangent to Circle

F: Curve Layout

G: Traverse on Curve

H: Parabolic Curve

I: Parabolic Layout

J: Straight Grade

K: Spiral

L: Spiral Layout

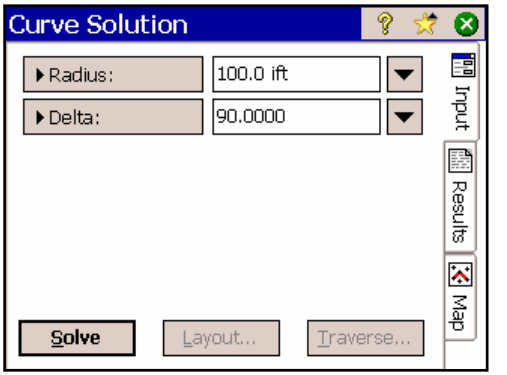
M: Traverse on Spiral

Curve Solution

Curve | Curve Solution

The Curve Solution screen provides detailed information on a curve when two parts of the curve are known.

The first known part of the curve is defined by one of the following:



- Radius: is the distance from the radius point to the curve.
- Delta: is the deflection angle.
- Degree Arc: is the deflection angle that results in a 100-ft. arc length.
- Degree Chord: is the deflection angle that results in a 100-ft. chord length.

The second known part of the curve is defined by one of the following:

- Delta: is the deflection angle.
- Length: is the arc length.
- Chord: is the chord length.
- Tangent: is the distance from the PC or PT to the PI.
- Mid Ordinate: is the distance between the curve and the chord at the center of the curve's length.
- External: The minimum distance between the PI and the curve.

Solve: Computes the details for the horizontal curve.

Layout...: Opens the Horizontal Curve Layout screen (Page R-381) where points can be created so the curve can be staked in the field.

Traverse...: Opens the Traverse on Curve screen (Page R-388).

Results:

Radius: is the distance from the radius point to the curve.

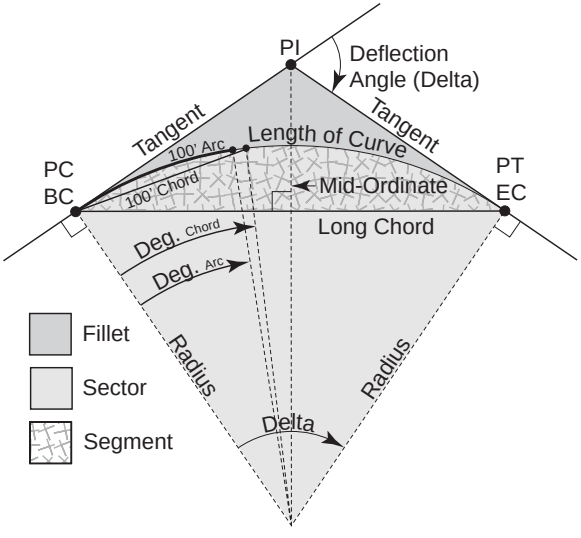
Length: is the arc length.

Chord: is the chord length.

Deg. Arc: is the deflection angle that results in a 100-ft. arc length.

Deg. Chord: is the deflection angle that results in a 100-ft. chord length.

Delta: is the deflection angle.



Tangent: is the distance from the PC or PT to the PI.

External: is the minimum distance between the PI and the curve.

Mid Ord.: is the distance between the curve and the chord at the center of the curve's length.

External: (not shown) The minimum distance between the PI and the curve.

Segment: is the area between the arc length and the chord.

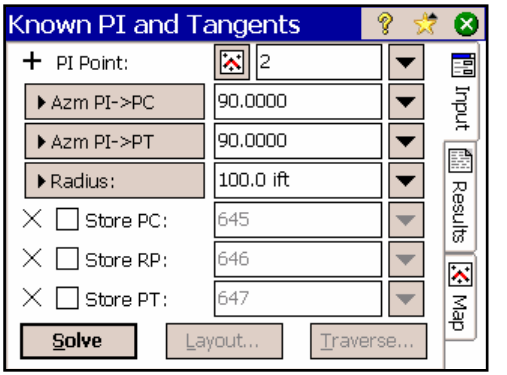
Sector: is the area between the arc length and the two edge radii.

Fillet: is the area between the arc length and the tangents.

Known PI and Tangents

Curve | PI and Tangents

The PI and Tangents screen is used to compute and store the PC, PT, and radius points when the PI point and the direction of both tangents are known, along with one other curve attribute.



PI Point: is the PI point.

Azm PI->PC / Brg PI->PC: is the direction of the tangent from the PI to the PC.

Azm PI->PT / Brg PI->PT: is the direction of the tangent from the PI to the PT.

The remaining curve attribute can be defined with one of the following selections:

- Radius: is the distance from the radius point to the curve.
- Delta: is the deflection angle.
- Degree Arc: is the deflection angle that results in a 100-ft. arc length.
- Degree Chord: is the deflection angle that results in a 100-ft. chord length.

☑ **Store PC**: When checked, will store the computed PC point with the specified point name.

☑ **Store RP**: When checked, will store the computed radius point with the specified point name.

☑ **Store PT**: When checked, will store the computed PT point with the specified point name.

Results

Radius: is the distance from the radius point to the curve.

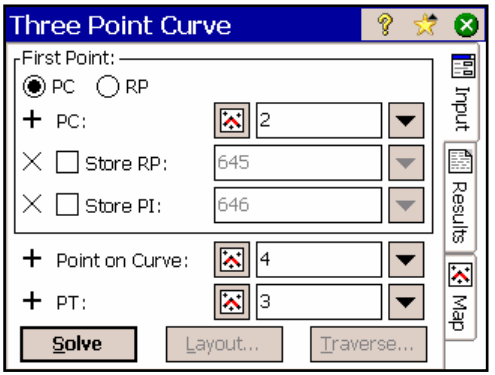
Delta: is the deflection angle.

Tangent: is the distance from the PC or PT to the PI.

Three Point Curve

Curve | 3 Point Curve

The Three Point Curve screen will compute the details of a curve when three points of the curve are specified; the PC, PT and any other point on the curve; or the PC, PT and radius point.



First point: is the first point from the current job that defines the curve. The specified point can be either the PC or the Radius Point by selecting the appropriate radio button.

Note: The selection made for the first point determines the available choices in the remaining fields.

Pt. on Curve: is any point that lies on the curve between the PC and PT.

PC: is the point that defines the beginning of the curve (Point of Curvature).

PT: is the point that defines the end of the curve (Point of Tangency).

☑ **Store RP**: When checked, the radius point will be computed and stored with the name specified here.

Solve: will compute the curve based on the selected points.

Traverse: opens the Traverse on Curve screen (Page R-388), where the curve can be included in a traverse.

Layout: opens the Curve Layout screen (Page R-381), where the location of points on a curve can be computed at any station interval.

Results

Radius: is the distance from the radius point to the curve.

Length: is the arc length.

Chord: is the chord length.

Delta: is the deflection angle.

Tangent: is the distance from the PC or PT to the PI.

Mid Ord.: is the distance between the curve and the chord at the center of the curve's length.

External: is the minimum distance between the PI and the curve.

Deg. Arc: is the deflection angle that results in a 100-ft. arc length.

Deg. Chord: is the deflection angle that results in a 100-ft. chord length.

Segment: is the area between the arc length and the chord.

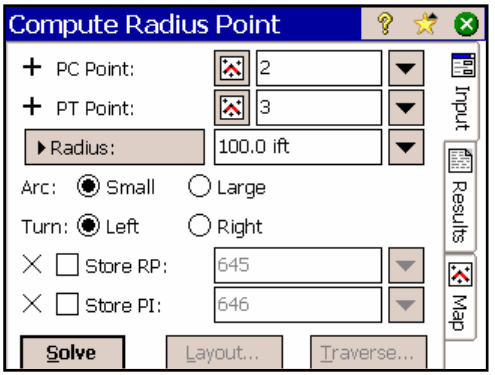
Sector: is the area between the arc length and the two edge radii.

Fillet: is the area between the arc length and the tangents.

Compute Radius Point

Curve | Radius Point

The Compute Radius Point screen is used to compute and optionally store the radius point for a curve when certain parts of the curve are known.



PC Point: is the point that defines the beginning of the curve (Point of Curvature).

PT Point: is the point that defines the end of the curve (Point of Tangency).

Turn: specifies if the curve turns to the Left or Right as you face the curve from the PC.

Arc: specifies if the arc is Small (less than 180°) or Large (greater than 180°).

The final part of the curve is defined by one of the following choices:

- Radius: is the distance from the radius point to the curve.
- Delta: is the deflection angle.
- Degree Arc: is the deflection angle that results in a 100-ft. arc length.
- Degree Chord: is the deflection angle that results in a 100-ft. chord length.

☑ **Store RP**: When checked, the computed radius point will be stored with the name specified here.

Solve: computes the location of the radius point.

Layout...: opens the Curve Layout screen (Page R-384).

Traverse...: opens the Traverse On Curve screen (Page R-388).

Results

Radius: is the distance from the radius point to the curve.

Length: is the arc length.

Chord: is the chord length.

Deg. Arc: is the deflection angle that results in a 100-ft. arc length.

Deg. Chord: is the deflection angle that results in a 100-ft. chord length.

Delta: is the deflection angle.

Tangent: is the distance from the PC or PT to the PI.

External: is the minimum distance between the PI and the curve.

Mid Ord.: is the distance between the curve and the chord at the center of the curve's length.

Segment: is the area between the arc length and the chord.

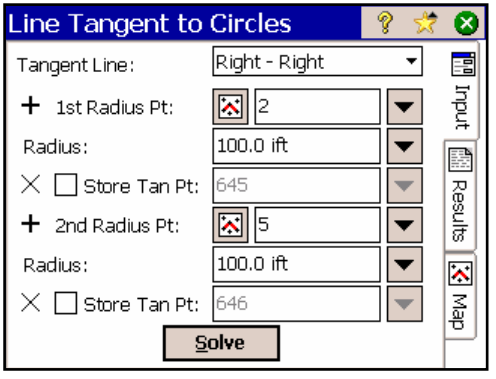
Sector: is the area between the arc length and the two edge radii.

Fillet: is the area between the arc length and the tangents.

Line Tangent to Circle

Curve | Tangent to Circle

Will compute the location of a line that is tangent to the specified sides of two specified circles.



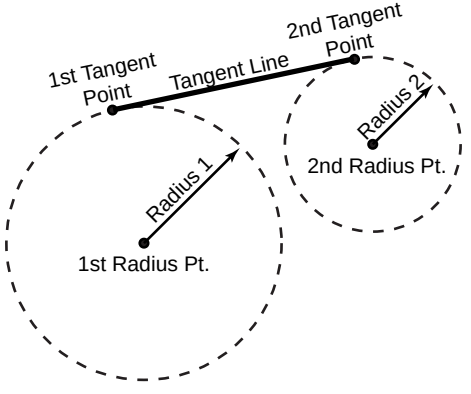
Tangent Line: determines which sides of the circles the computed line will be tangent to as you occupy the 1st Radius Point and face the 2nd Radius Point. (See illustration below.)

1st / **2nd Radius Pt**: defines the points around which the circles are computed.

Radius: defines the radius of the circles that are used to compute the Tangent Line.

☑ **Store Tan Pt**: When checked, will store the computed tangent points.

Solve: computes the location of the tangent line and optionally stores the two tangent points.



Line Tangent to Circles solution illustrating the location of a **Left-Left** Tangent Line.

Results

TP 1: displays the coordinates for the first tangent point.

TP 2: displays the coordinates for the second tangent point.

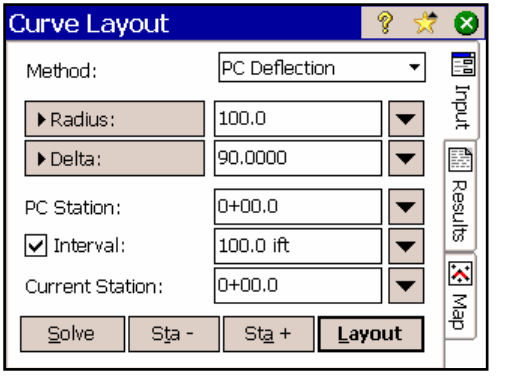
Azimuth: is the azimuth of the tangent line from the first tangent point to the second.

Distance: is the length of the tangent line.

Curve Layout

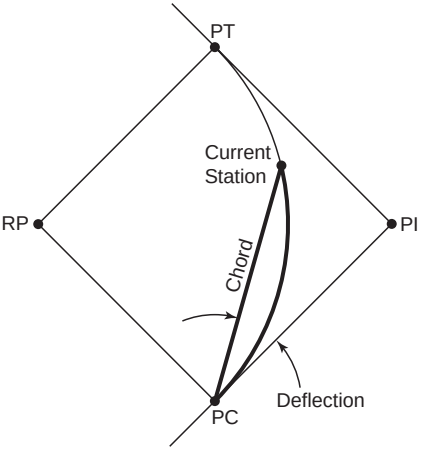
Curve | Curve Layout

The Curve Layout screen is used to assist in the layout of a horizontal curve by computing the direction and distance to points on the curve using a variety of methods.

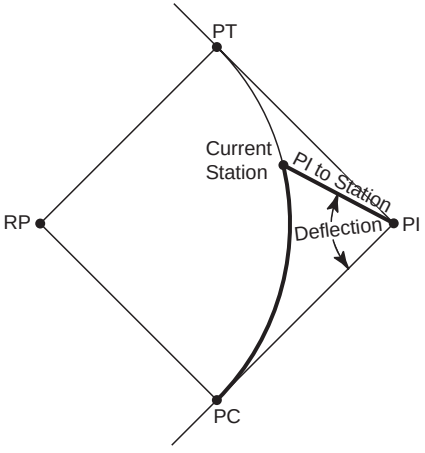


Method: The method determines how the points on the curve are laid out. Each method is described below.

- **PC Deflection**: provides deflection angles and distances to each station on the curve as if occupying the PC and backsighting the PI. The results are given in the following format:
  - **Station**: is the current station on the curve.
  - **Deflection**: is the angle to turn to the current station.
  - **Long chord**: is the distance from the PC to the current station.
  - **Short chord**: is the distance from the previous station to the current station.

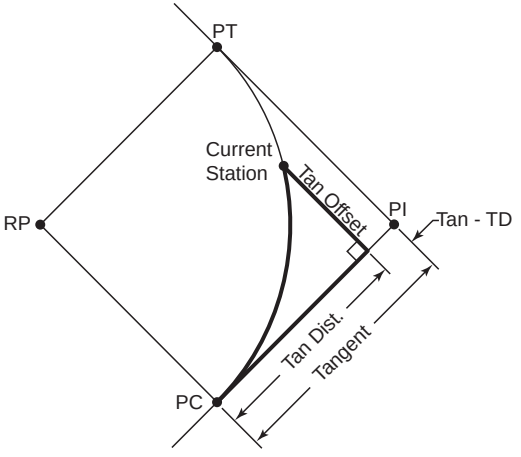


PC Deflection



PI Deflection

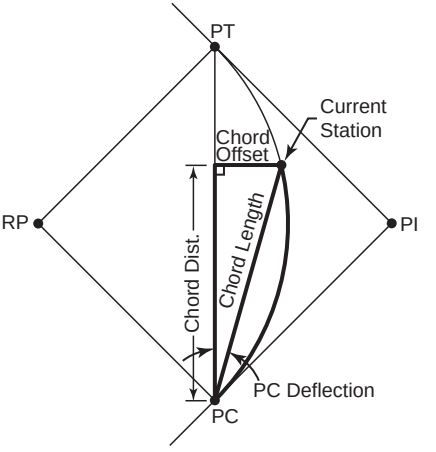
- **PI Deflection**: provides deflection angles and distances to each station on the curve as if occupying the PI and backsight the PC. The results are given in the following format:
  - **Station**: is the current station on the curve.
  - **Deflection**: is the angle to turn to the current station.
  - **PI to Station**: is the distance from the PI to the current station.



Tangent Offset

- **Tangent Offset**: provides perpendicular offset information from the tangent (the line from the PC to the PI) for each station on the curve. The results are given in the following format:
  - **Station**: is the current station on the curve
  - **Tan dist (TD)**: is the distance on the tangent, from the PC to the PI, or the PI to the PT, where the perpendicular offset occurs.
  - **Tan offset**: is the distance, perpendicular to the tangent, to the curve at the particular station.
  - **Tan**: is the length of the tangent (the distance from the PC to the PI).
  - **Tan – TD**: is the distance on the tangent, from the PI to the PC, or the PI to the PT, where the offset occurs

- **Chord Offset**: provides perpendicular offset information from the chord (the line from the PC to the PT) for each station on the curve. PC deflection information is also provided. The results are given in the following format:
  - **Station**: is the current station on the curve.
  - **Chord dist.**: is the distance on the long chord from the PC (toward the PT) where the perpendicular offset occurs.
  - **Chord offset**: is the distance to the current station on the curve, perpendicular to the long chord.
  - **PC Deflection**: is the angle to turn to the current station, as if occupying the PC and backsighting the PI.
  - **Chord Length**: is the distance from the PC to the current station on the curve.



Chord Offset

The first known part of the curve is defined by one of the following:

- Radius: is the distance from the radius point to the curve.
- Delta: is the deflection angle.
- Degree Arc: is the deflection angle that results in a 100-ft. arc length.
- Degree Chord: is the deflection angle that results in a 100-ft. chord length.

The second known part of the curve is defined by one of the following:

- Delta: is the deflection angle.
- Length: is the arc length.
- Chord: is the chord length.
- Tangent: is the distance from the PC or PT to the PI.
- Mid Ordinate: is the distance between the curve and the chord at the center of the curve's length.

- External: is the minimum distance between the PI and the curve.

PC Station: is the starting station assigned to the PC.

☑ **Interval**: When checked, all necessary information for each station at the specified interval on the curve will be computed.

Start station: when not computing by interval (above), only the information for the particular station entered here is computed.

Solve: will solve and display all the details of the specified curve, without the layout information.

Sta -: decreases the current station by the station interval.

Sta +: increases the current station by the station interval.

Layout: will solve and display the layout information for all the stations of the specified curve.

Results

Radius: is the distance from the radius point to the curve.

Length: is the arc length.

Chord: is the chord length.

Delta: is the deflection angle.

Tangent: is the distance from the PC or PT to the PI.

Mid Ord.: is the distance between the curve and the chord at the center of the curve's length.

External: is the minimum distance between the PI and the curve.

Deg. Arc: is the deflection angle that results in a 100-ft. arc length.

Deg. Chord: is the deflection angle that results in a 100-ft. chord length.

Segment: is the area between the arc length and the chord.

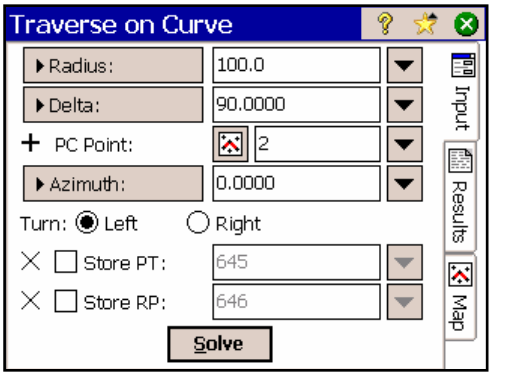
Sector: is the area between the arc length and the two edge radii.

Fillet: is the area between the arc length and the tangents.

Traverse on Curve

Curve | Trav. on Curve

The Traverse on Curve screen will compute the PT and radius point for a curve when the tangent azimuth at a PC point is known.



The first known part of the curve is defined by one of the following:

- Radius: is the distance from the radius point to the curve.
- Delta: is the deflection angle.
- Degree Arc: is the deflection angle that results in a 100-ft. arc length.
- Degree Chord: is the deflection angle that results in a 100-ft. chord length.

The second known part of the curve is defined by one of the following:

- Delta: is the deflection angle.
- Length: is the arc length.
- Chord: is the chord length.
- Tangent: is the distance from the PC or PT to the PI.
- Mid Ordinate: is the distance between the curve and the chord at the center of the curve's length.
- External: is the minimum distance between the PI and the curve.

PC Point: is the point that defines the beginning of the curve (Point of Curvature).

Azimuth / Bearing: is the direction of the tangent at the beginning of the curve.

Turn: specifies if the curve turns to the Left or Right as you face the curve from the PC.

☑ **Store PT**: When checked, will store the computed PT point with the specified point name.

☑ **Store RP**: When checked, the computed radius point will be stored with the name specified here.

Solve: will compute and store the PT, and if desired, the radius point.

Results

Radius: is the distance from the radius point to the curve.

Length: is the arc length.

Chord: is the chord length.

Delta: is the deflection angle.

Tangent: is the distance from the PC or PT to the PI.

Mid Ord.: is the distance between the curve and the chord at the center of the curve's length.

External: is the minimum distance between the PI and the curve.

Deg. Arc: is the deflection angle that results in a 100-ft. arc length.

Deg. Chord: is the deflection angle that results in a 100-ft. chord length.

Segment: is the area between the arc length and the chord.

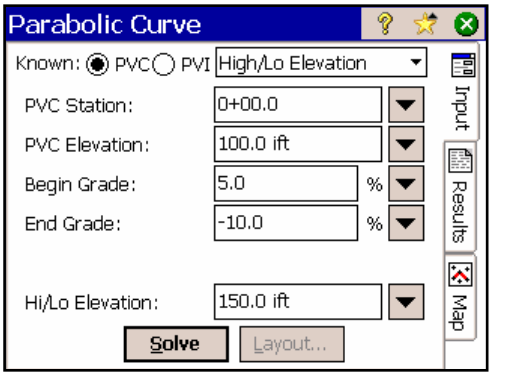
Sector: is the area between the arc length and the two edge radii.

Fillet: is the area between the arc length and the tangents.

Parabolic Curve

Curve | Parabolic Curve

The Parabolic Curve screen provides detailed information on a vertical parabolic curve when certain parts of the curve are known.



Known: The PVC or PVI radio button is selected to define which point on the curve is known.

One of the following options must be selected from the dropdown list:

- **Curve Length**: is selected when the length of the curve is known. When selected the following must also be specified:
  - **Curve length**: is the length of the vertical curve (the horizontal distance between the PVC and PVT).
- **Point On Curve**: is selected when the location of another point on the curve is known. When selected, the following must also be specified.
  - **Station**: is the station where the other point is located on the curve.
  - **Elevation**: is the elevation of the other point.
- **Hi/Lo Elevation**: is selected when the high or low point for the curve is known. When selected, the following must also be specified.
  - **Hi/Lo Elevation**: is the elevation of the curve at the location where the tangent is zero (the crest of the curve).

Note: When the begin and end grades are both positive or both negative, the high / low elevation will not be located between the PVC and PVT.

PVC / **PVI Station**: is the station for the specified point.

PVC / **PVI Elevation**: is the elevation for the specified point.

Begin Grade: is the grade at the tangent of the PVC.

End Grade: is the grade at the tangent of the PVT.

Solve : computes the details for the vertical curve.

Layout : opens the Parabolic Curve Layout screen (Page R-392) where you can solve for an elevation at a specified station, or solve for a station at a specified elevation.

Results

PVC sta.: is the station at the PVC.

PVI sta.: is the station at the PVI.

PVT sta.: is the station at the PVT.

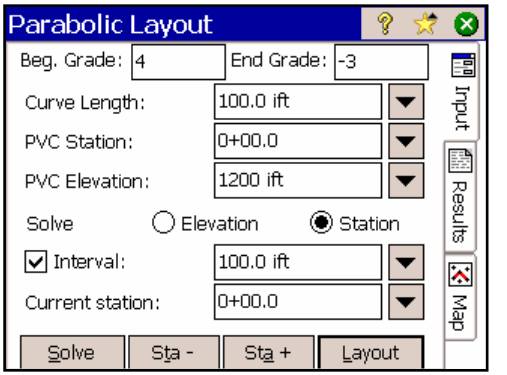
Hi/Lo sta.: is the station where the vertical curve has a tangent equal to zero (the crest of the curve).

elev.: is the elevation for the respective point.

Parabolic Layout

Curve | Parabolic Layout

The Parabolic Layout screen allows you to compute an elevation at a specified station, or a station at a specified elevation.



Beg. Grade: is the percent grade at the PVC.

End Grade: is the percent grade at the PVT.

Curve Length: is the horizontal distance between the PVC and PVT.

PVC Station: is the starting station at the PVC.

PVC Elevation: is the elevation at the PVC.

Solve for: is where you select to solve for an unknown Elevation, or an unknown Station. The selection made here determines which of the following choices will be available.

☑ **Interval**: When checked, the Current station can be incremented by the specified interval by using the Sta - and Sta + buttons and then re-computed with the Layout button.

Current station: is the station that will be solved for with the Layout button.

Elevation: is the known elevation for the location(s) on the parabolic curve where you want to compute the station(s).

Solve: computes the details of the vertical curve.

Sta -: decreases the Current station by the Interval.

Sta +: increases the Current station by the Interval.

Layout: computes either the elevation at the specified Current station or the station(s) at the specified Elevation.

Results

PVC sta.: is the station at the PVC.

PVI sta.: is the station at the PVI.

PVT sta.: is the station at the PVT.

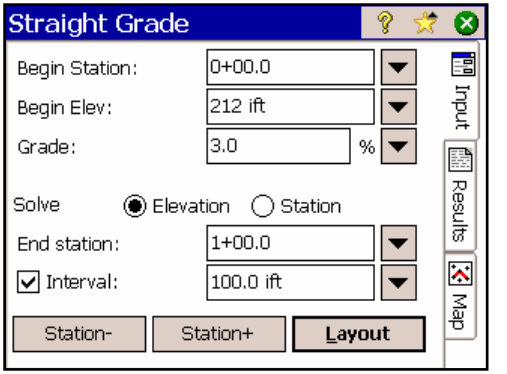
elev.: is the elevation for the respective point.

Hi/Lo sta.: is the station where the vertical curve has a tangent equal to zero (the crest of the curve).

Straight Grade

Curve | Straight Grade

The Straight Grade screen will solve for the elevation at a specified station or a station at a specified elevation on a straight grade.



Begin Station: is the station where the straight grade begins.

Begin Elev: is the elevation at the Begin station.

Grade: is the percent slope ($\frac{\text{Rise}}{\text{Run}} \cdot 100$).

Solve for: is where you select to solve for an Elevation or a Station. The choice made here determines which of the following selections are available.

End station: is the station where you want to compute the elevation.

☑ **Interval**: When checked, the End station can be incremented by the specified interval by using the Station- and Station+ buttons and then re-computed with the Layout button.

End Elevation: is the elevation at the point where you want to compute the station.

Layout: performs the computation and displays the results.

Results

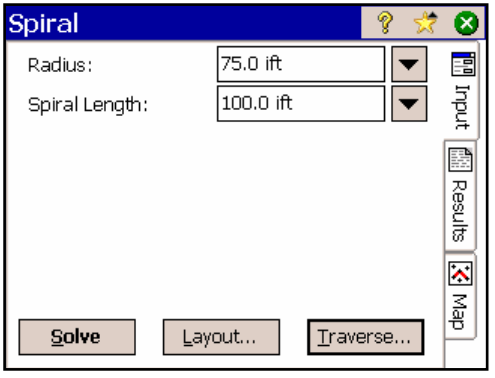
Station: is the current station.

Elevation: is the elevation for the current station.

Spiral

Curve Spiral

The Spiral screen will compute the details of a spiral curve, given the spiral length and radius.



Spiral length: is the length of the spiral curve.

Radius: is the circular curve radius.

Solve: computes the details of the spiral curve.

Layout...: opens the Spiral Layout screen (Page R-396) where the location of stations on the spiral curve can be computed.

Traverse...: opens the Traverse on Spiral screen (Page R-397).

Results

X of Throw: is the distance along the tangent where a perpendicular line intersects with the radius point.

Y of Throw: is the minimum distance between the tangent and the extended circular curve.

X: is the distance from the TS to the SC along the tangent.

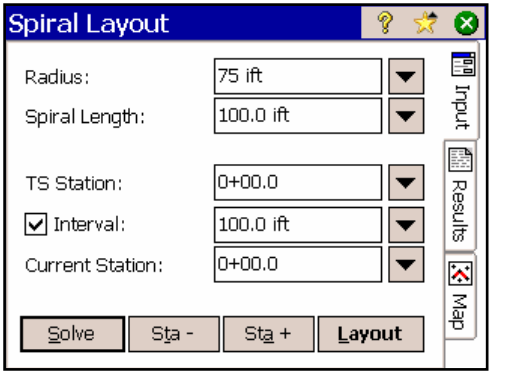
Y: is distance from the SC to the tangent.

Delta: is the angle between the tangent, and the line between the PI and SC.

Spiral Layout

Curve | Spiral

The Spiral Layout screen is used to compute station locations on a spiral curve.



Radius: is the radius of the circular curve.

Spiral Length: is the length along the spiral curve from TS to SC.

TS station: is the station at the TS point.

☑ **Interval**: When checked, is the spiral arc distance that is added or subtracted from the Current Station using the Sta + and Sta – buttons.

Current Station: is the station on the curve that is computed.

Solve: solves and displays the details for the specified spiral curve.

Sta -: decreases the Current Station by the specified Interval.

Sta +: increases the Current Station by the specified Interval.

Layout: computes the location of the Current Station.

Results

Station: is the current station.

Deflection: is the horizontal angle to the current station as if occupying the TS and backsighting the Spiral PI.

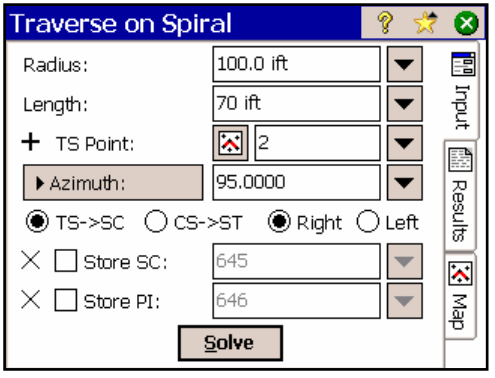
Long crd.: is the chord length from the TS to the current station.

Short crd.: is the chord length from the previous station to the current station.

Traverse on Spiral

Curve | Trav. on Spiral

The Traverse on Spiral screen is used to compute the location of, and optionally store the SC, or ST and spiral PI points.



Radius: is the radius of the circular curve.

Length: is the length along the spiral curve from TS to SC.

TS / **CS Point**: is the existing point associated with the TS or CS point.

Azimuth / Bearing: is the tangent direction at the TS or CS point.

TS->SC: specifies that the curve starts at the tangent to spiral and ends at the spiral to curve.

CS->ST: specifies that the curve starts at the curve to spiral and ends at the spiral to tangent.

Right / **Left**: specifies is the curve turns toward the right or left as you face the spiral from the TS or CS.

☑ **Store SC** / **ST**: When checked, saves a point for the computed SC point.

☑ **Store PI**: When checked, saves a point for the computed spiral PI.

Results

Tangent In: the tangent direction entering the spiral at the TS or CS.

Tangent Out: the tangent direction exiting the spiral at the SC or ST.

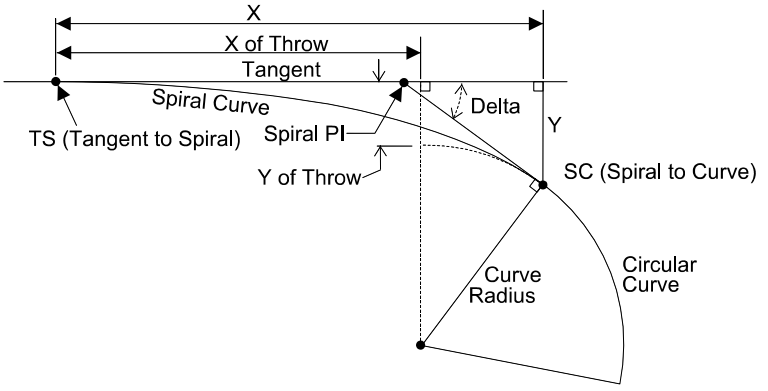
X of Throw: is the distance along the tangent where a perpendicular line intersects with the radius point.

Y of Throw: is the minimum distance between the tangent and the extended circular curve.

X: is the distance from the TS to the SC along the tangent.

Y: is distance from the SC to the tangent.

Delta: is the angle between the tangent, and the line between the PI and SC.



Roads Menu

The Roads Menu contains the routines used to perform road layout.

A: Edit Templates

B: Edit Alignments

C: Edit Roads

D: Road Stakeout

E: Slope Staking

F: Show Station (Road Station and Offset)

Add/Edit Templates

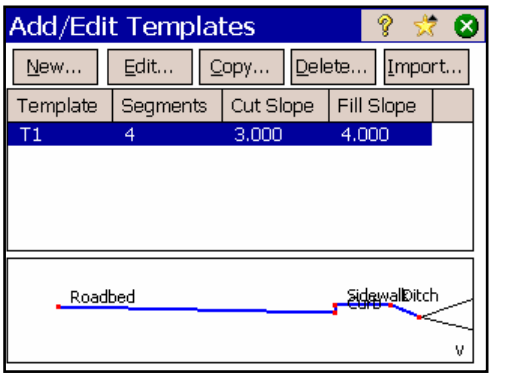
Roads | Edit Templates

The Add/Edit Templates screen is used to edit an existing template or create a new template.

Templates describe the cross-sectional profile of a roadway. They can contain information such as the road width, its slope, a curb, and/or a ditch. Each separate portion of a template is called a *segment*. All templates must have at least one segment and all templates of a particular road must have the same number of segments.

Any template can describe either the left or right side of the road's cross-section (they're reversible). If a road's left and right side are identical, only one template needs to be created; the other side can use the same template, or be "mirrored" later when the road is defined.

All of the saved templates are listed displayed in this screen including each template's name, number of segment, cut slope, and fill slope. An image of the selected segment is also displayed in this screen.



New...: opens the New Template screen where a new template can be created. This screen is identical to the Edit Template screen except most the buttons are initially deactivated.

Edit...: opens the Edit Template screen where the selected template can be edited.

Copy...: opens the Save As dialog box where a copy of the selected template can be saved with a different name.

Delete...: deletes the selected template.

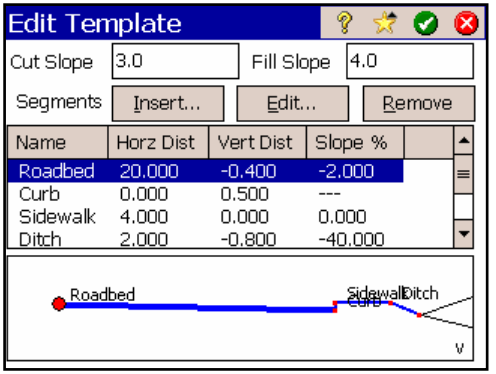
Import...: opens the Open dialog box where a template can be copied from one folder to the current folder and imported into the job.

Edit Template

Roads | Edit Templates | Edit... or

Roads | Edit Templates | New...

The Edit Template screen is identical to the New Template screen and is used to create a new template or edit an existing one.



All of the segments of the current template are listed in the screen. The list shows the name of each segment, the horizontal and vertical offsets (lengths), and the slope.

Note: The length of the first segment must be greater than zero.

Cut Slope: is the slope that will be used when locating the catch point in a situation where the existing terrain is above the level of the hinge point.

Fill Slope: is the slope that will be used when locating the catch point in a situation where the existing terrain is below the level of the hinge point.

Insert...: opens the Edit Segment screen where a new segment will be added prior to (above) the segment selected in the Edit Template screen.

Note: To add a segment to the end of all existing segments (furthest away from the centerline), be sure <End> is selected from the Edit Template screen prior to tapping Insert....

Edit...: opens the Edit Segment screen where the details of the selected segment can be edited.

Note: The selected segment is shown with a thicker line in the map view in the lower portion of the Edit Template screen.

Remove: removes the selected segment and automatically joins the previous segments to the following segments.

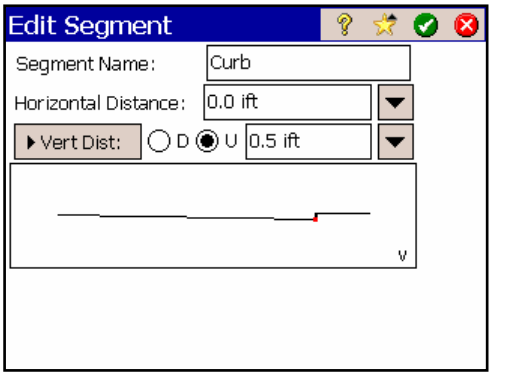
Note: When a segment is removed the existing segments toward the centerline will not change. Only those on the side of the removed segment away from the centerline are adjusted.

Edit Segment

Roads | Edit Templates | Edit... | Insert... or

Roads | Edit Templates | Edit... | Edit... or

Roads | Edit Templates | New... | Insert...



The Edit Segment screen is identical to the New Template screen and is used to create a new template or edit an existing one.

Segment Name: is the name for the segment. A name is required, but it does not have to be unique.

Horizontal Distance: is the horizontal length of the segment.

Slope / V Dist: is the slope of the segment, or the vertical length, respectively. When defining a vertical distance, select the ⊙ D if the segment travels downward, or select ⊙ U if the segment travels upward from the point of view of the centerline.

Note: A segment with a negative slope will result in water that flows from the centerline toward the road edge.

Edit Alignments

Roads | Edit Alignments or

Job | Edit Alignments

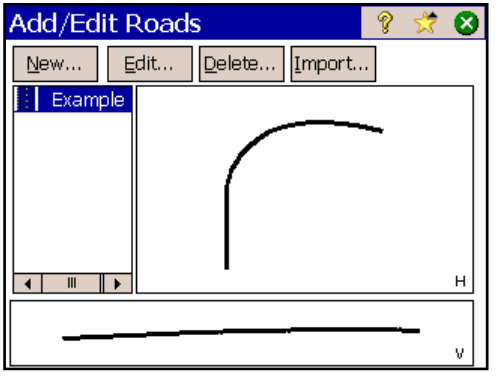
The Edit Alignments screen is used to create an alignment that defines the centerline of a road containing both horizontal and vertical elements. Editing alignments is fully described, starting on Page R-68.

Add/Edit Roads

Roads | Edit Roads

The Add/Edit Roads screen is used to define your road. This is where the templates are added to the alignment and any widenings and super elevations are defined.

All existing roads are listed in this screen. If an existing road is selected, the overhead and profile view of that road are also displayed.



New...: Opens the New Road screen where a new road can be defined.

Edit...: Opens the Edit Road screen where the selected road can be edited. The Edit Road screen is identical to the New Road screen.

Delete...: Opens the following prompts to delete the selected road(s).

- **Are you sure you want to delete the selected Roads?**: Answering **Yes** to this prompt will disassociate the selected road(s) from the current job so they are no longer displayed in the Add/Edit Roads screen. In this case, the road can still be re-associated with the Import... routine. Answering **No** to this prompt will return you to the Add/Edit Roads screen without making any changes.

- **Delete alignment *alignment name*?**: Answering **Yes** to this prompt will delete the selected alignment(s) from the current job so they are no longer displayed in the Edit Alignments screen. In this case, the alignment can be re-associated with the Import... routine from the definition in the RD5 file. Answering **No** to this prompt will open the next prompt without deleting the selected alignment(s) from the current job.
- **Delete *Roadname*.RD5 file?**: Answering **Yes** to this prompt will permanently delete the selected alignments and road (RD5) files from the data collector.

Import...: Opens the Import Road screen where an existing road (RD5) file can be added to the current job. This is useful to copy road files that were transferred to the data collector from a PC and to add roads that were stored in a directory other than the current directory.

New Road Screen / Edit Road

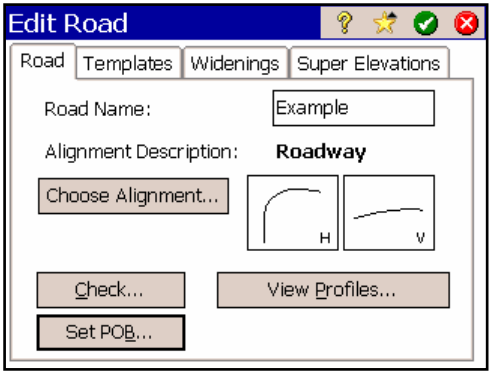
Roads | Edit Roads | New... or Edit...

The New Road screen is identical to the Edit Road screen and is used to assemble the parts of a road or edit an existing road. This screen consists of five separate index card style tabs. Each tab opens a different card that is used to define a particular part of the road.

The Road Card

Roads | Edit Roads | (New... or Edit...) | Road

The Road card of the New Road screen is used to select the alignment to use for the road. If an alignment has not yet been created, refer to Page R-68 for information on creating an alignment.



Road Name: is the name assigned to the road. The name must not be the same as any existing road name.

Alignment Description: displays the name of the selected alignment.

Choose Alignment: opens the Choose Alignment screen where an existing alignment can be selected.

Check: checks the road for errors and displays the results in the Roads Report screen.

View Profiles: opens the Road Profiles screen where you can see information about the cross-sectional profile of the road at any station.

Set POB...: opens the Road Alignment Properties screen where information about the current alignment can be changed.

Roads Report Screen

Roads | Edit Roads | (New... or Edit...) | Road | Check...

The Roads Report screen displays a list of any errors after performing the following tests.

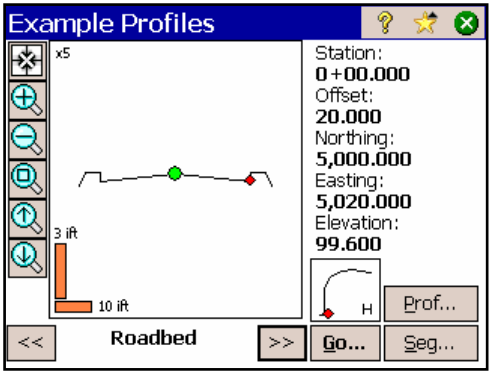
- Confirm that the alignment contains both a HAL and a VAL.
- Confirm that the horizontal length of the VAL is greater than or equal to the HAL.
- Confirm there is at least one template for each side of the road.

- Confirm the first template coincides with the starting station.
- Confirm that all template segments have a name. (The names do not have to be unique.)
- Confirm that the same number of segments exist on each side of the alignment.
- Confirm that each widening start station is less than the corresponding widening's end station.
- Confirm that one widening does not overlap with another widening.
- Confirm that the start station for each super elevation is less than the end station.
- Confirm that no two super elevations overlap.
- Confirm that the start and end of each super elevation either both hinge on the centerline or both hinge on the edge.
- Confirms all templates, widening and super elevations are on the alignment.
- Confirms no more than one template exists at any particular station on the same side of the road.
- Confirms the first segment of all templates is greater than 0.
- Checks for empty templates.
- Checks for widenings with zero width.
- Checks for overlapping parabolic transitions.
- Checks for template-widening width matching.
- Checks for template-super elevation slope matching.

Road Profiles Screen

Roads | Edit Roads | (New... or Edit...) | Road | View Profiles...

The Road Profiles screen allows you to see information about the cross-sectional profile of the road at any station after at least one template has been added to each side of the road.



<< , >> : these buttons move a red circle icon that starts at the centerline, which is indicated by a green circle, to each node of the template at the current station. Information for the selected segment is displayed in the right portion of the screen. The name for the selected segment is shown between these buttons.

Go... : opens a dialog box where a specific station can be entered. Once ✔ is tapped, the profile at the entered location is shown in the Road Profiles screen.

Prof... : opens the profile Details screen and lists several details about the road's cross-sectional profile at the current station.

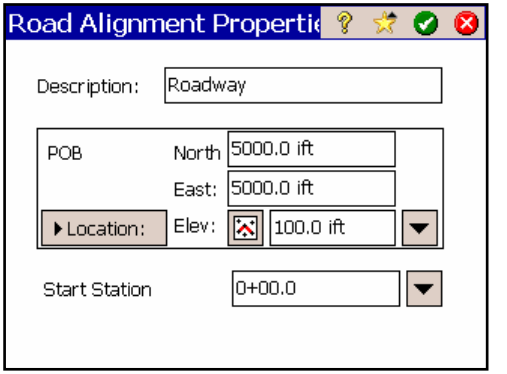
Seg... : opens the segment Details screen and lists information related to the selected segment at the current station.

Road Alignment Properties Screen

Roads | Edit Roads | (New... or Edit...) | Road | Set POB...

The Road Alignment Properties screen is used to change information about the current alignment.

Description: is the name of the current alignment. A new name can be assigned to the alignment from this field.



Point / Location: depending how this button is toggled, you can change the POB of the alignment by entering a new point number or new coordinates.

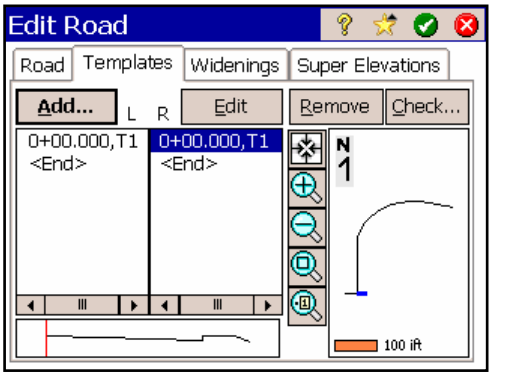
Start Station: replaces the existing starting station of the alignment with the starting station entered here.

The Templates Card

Roads Edit Roads (New... or Edit...) Templates

The Templates card of the New Road screen is used to add existing templates to the road.

The screen displays a list of left and right templates that are currently assigned to the road. When a particular template is selected, a cross-sectional profile view of the selected template is displayed and an overhead view shows where the selected template occurs on the alignment.



Add...: when a template or <End> is selected from the L or R columns in the Templates card, this button opens the Add Template screen, which allows you to add a new template to the same side of the road that was selected.

Edit: allows you to edit the selected template in the Edit Template screen, which is identical to the Add Template screen.

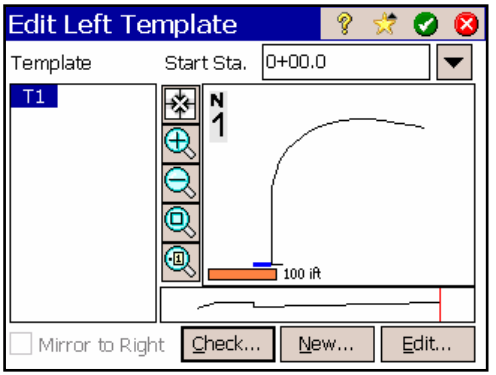
Remove: removes the selected template from the list.

Check...: checks the road for errors and displays the results in the Roads Report screen, described above.

Add / Edit Template Screen

Roads | Edit Roads (New... or Edit...) | Templates (Add... or Edit...)

The Add / Edit Template screen allows you to add a template to the road or edit an existing template.



Template: The Template column lists all the templates that can be added to the road. Selecting a template will display an image of that template in the lower corner of the screen. Once the first template is added, this box will only list templates with the same number of segments as the first.

Start Sta: is the location of the template on the alignment.

Check...: opens the Roads Report screen and displays any errors (see Page R-405)

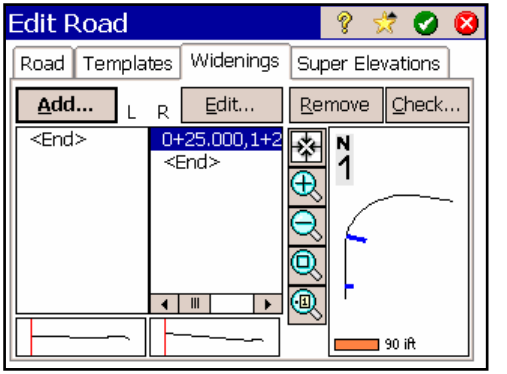
New...: opens the New Template screen, which is identical to the Edit Template screen, where a new template can be created (see Page R-401).

Edit...: opens the Edit Template screen where the selected template can be modified (see Page R-401), although accessing the templates editor from here will not allow inserting or removing of segments.

The Widenings Card

Roads | Edit Roads | (New... or Edit...) | Widenings

The Widenings card of the New Road screen is used to add or edit widenings.



A widening is a section of a road that changes in width, but does not necessarily require any new templates. The road width is adjusted by changing only the width of the first segment of the template that leads into the beginning of the widening. Any additional segments, like those that may describe a sidewalk or ditch, are not adjusted.

The following rules must be considered when adding a widening to a road:

- A widening must have a starting station and an ending station or a length.
- Left and right widenings are separate and independent of each other.
- The start and end stations must occur within the boundaries of the alignment.
- The starting station must occur before the ending station.
- The beginning of a widening must match the width of the previous widening or template.
- The end of a widening must match the next template or widening unless it is the last element in the road.
- The beginning or ending of a widening cannot occur within the boundaries of another widening, but the beginning of one widening can occur at the same station as the end of a previous widening.
- Widenings are always positioned by their start station.

Add...: when a widening or <End> is selected from the L or R columns in the Widenings card, this button opens the Add Widening

screen, which allows you to add a widening to the same side of the road that was selected.

Edit: allows you to edit the selected widening in the Edit Widening screen, which is identical to the Add Widening screen.

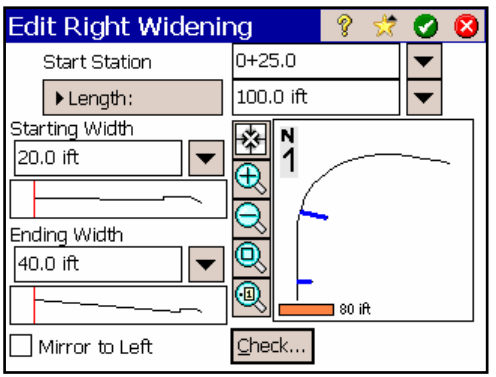
Remove: removes the selected widening from the list.

Check...: checks the road for errors and displays the results in the Roads Report screen, described on Page R-405.

Add / Edit Widening Screen

Roads Edit Roads (New... or Edit...) Widenings (Add... or Edit...)

The Add / Edit Widening screen allows you to add a widening to the road or edit an existing widening.



Start Station: is the location of the beginning of the widening on the alignment.

Length / End Station: is the length of the widening measured from the Start Station, or it is the end station, depending on how the button is toggled.

Starting Width: is the starting width of the widening. This must match the width of the previous template, or widening.

Ending Width: is the ending width of the widening.

Check...: opens the Roads Report screen and displays any errors (see Page R-405)

New...: opens the New Widening screen, which is identical to the Edit Widening screen, where a new widening can be created (see Page R-401).

Edit...: opens the Edit Widening screen where the selected widening can be modified (see Page R-401).

☑ **Mirror to Right / Left**: duplicates the widening to the other side of the road when checked.

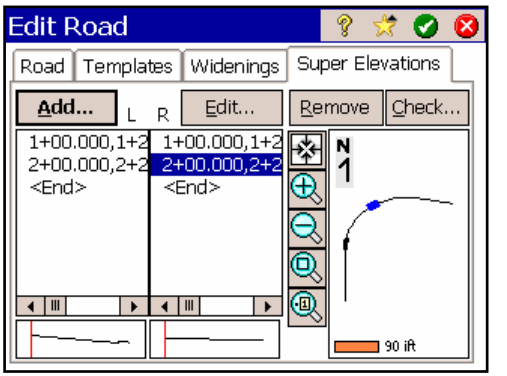
Super Elevations Card

Roads | Edit Roads | (New... or Edit...) | Super Elevations

The Super Elevations card of the New Road screen is used to add or edit super elevations.

A super elevation changes the cross slope of the first segment of a template in order to bank a curve – the slope of any remaining segments will remain unadjusted. One super elevation defines a begin point and an end point where the slope change begins and where it finishes the transition for one side of a road. Therefore, to bank a two-lane road, four super elevations would be required – one at the beginning and one at the end of the curve for each side of the road.

A super elevation can either hinge at the outer edge of the first segment, or at the centerline. Hinging at the center results in the elevation of the outer segments to change. Hinging at the edge results in the elevation of the centerline changing. Because of this, Survey Pro will only allow you to hinge on edge for one side of a road. If the other side is also super elevated, you will be forced to hinge that side at the center so that an abrupt change in elevation does not occur at the centerline.



Add... : when a super elevation or <End> is selected from the L or R columns in the Super Elevations card, this button opens the Add Super Elevation screen, which allows you to add a super elevation to the same side of the road that was selected. (Widenings and super elevations are always sorted in this list by their specified start stations.)

Edit : allows you to edit the selected super elevation in the Edit Super Elevation screen, which is identical to the Add Super Elevation screen.

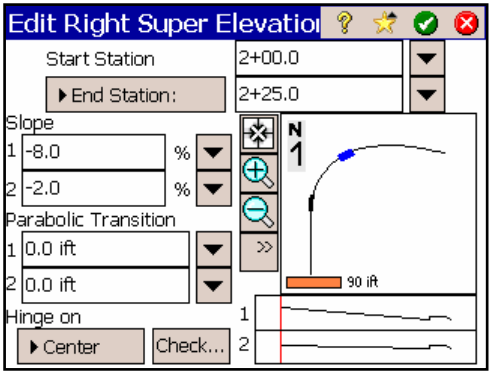
Remove : removes the selected super elevation from the list.

Check... : checks the road for errors and displays the results in the Roads Report screen, described on Page R-405.

Add / Edit Super Elevation Screen

Roads Edit Roads (New... or Edit...) Super Elevations (Add... or Edit...)

The Add / Edit Super Elevation screen allows you to add a super elevation to the road or edit an existing super elevation.



Start Station: is the location of the beginning of the super elevation on the alignment.

Length / End Station: is the length of the super elevation measured from the Start Station, or it is the end station, depending on how the button is toggled.

Note: Keep in mind that the slope at the end of a super elevation will continue down the road unless another super elevation is entered to change the slope back again. For example, a curve will typically require two super elevations for each side of the road: one at the beginning of the curve and one at the end.

Slope 1 / **2**: is the starting and ending slopes of the road, respectively. The starting slope must match the current slope of the road at that station.

Parabolic Transition 1 / **2**: is the length of the vertical curve that will lead in and out of the super elevation, respectively. Parabolic transitions are optional parts of a super elevation and result in a smoother change going into and coming out of a super elevation, similar to how a spiral curve is used with a horizontal curve.

Note: One half of the parabolic transition length will extend before and after the starting point and/or the ending point of the super elevation. This should be considered when using parabolic transitions near the end of an alignment since this length cannot extend beyond the limits of the road.

Hinge on ▸ Center / ▸ Edge: determines if the super elevation is computed by rotating the road around the centerline or the road's edge.

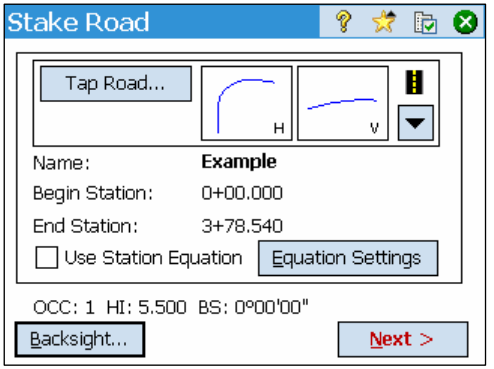
Note: When hinging on edge, the road is actually rotated around the end of the first segment of the template that leads into the super elevation.

Only the first segment is adjusted with a super elevation. The length and slope of any segments beyond the first will not be adjusted from a super elevation.

Check...: checks the road for errors and displays the results in the Roads Report screen, described on Page R-405.

Road Stakeout

Roads | Road Stakeout



The Stake Road screen is used to stake any segment of a road profile at any station.

Use Station Equation: When checked, the current station equation will be applied to the road.

Equation Settings: opens the Station Equation screen (Page R-427) where a station equation can be configured.

Tap Road...: opens the Tap on a Road screen where you can tap on any road in the job to select it.

Name: displays the name of the selected road.

Begin Station: displays the station assigned to the beginning of the road.

End Station: displays the final station in the road.

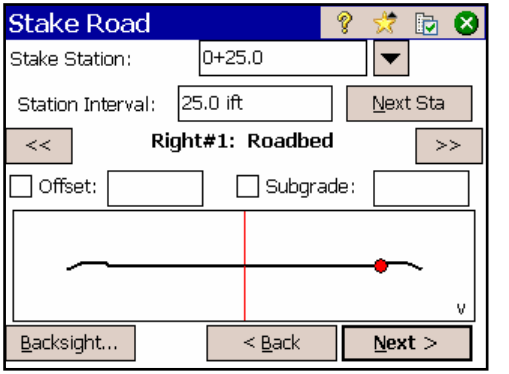
Backsight...: opens the Backsight Setup screen (Page R-118).

Next >: takes you to the next Stake Road screen where a specific point on the road can be selected to stake.

Stake Road – Screen Two

The second Stake Road screen displays a cross-sectional profile view of the road at the current station. Any particular point on this view can be selected and staked.

Station Interval: is the value that is added to the Station to Stake after the Next Station button is pressed.



Next Station: advances the Station to Stake by the Station Interval.

Note: If the Stake Corners option is selected in the Stakeout Settings screen, the Next Station button will also stop at any horizontal or vertical alignment node, and the beginning and end of any widening and super elevation that falls within the interval.

<<, >>: These buttons are used to select the particular node, or an offset to it, from your road profile that you wish to stake. The segment name at the selected node is also displayed. If staking the centerline with an offset, the side of the road that the offset occurs is also displayed.

Offset: When checked, allows you to specify a horizontal offset distance away from the centerline to stake as opposed to staking the actual node locations.

Note: A **positive** value offset is applied at the specified distance from each node **away from the centerline**. A **negative** value offset is applied at the specified distance from each node **toward the centerline**.

Note: If an offset occurs past the edge of the road, no vertical or cut / fill information will be computed for that point.

Subgrade: When checked, allows you to specify a vertical offset from the actual node locations. Positive values result in the stake location occurring below the selected node. Negative values result in the stake location occurring above the selected node.

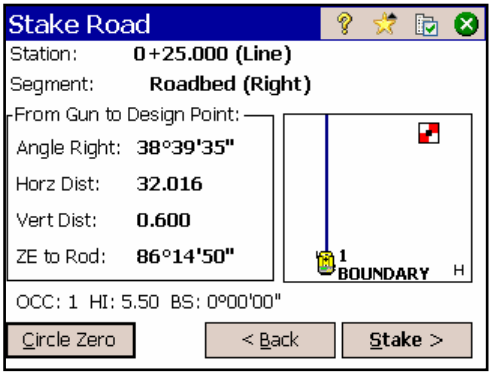
Backsight...: opens the Backsight Setup screen (Page R-118).

< Back: returns to the previous screen.

Next >: takes you to the next Stake Road screen where the direction and distance information to the stake point is displayed.

Stake Road – Screen Three

The third Stake Road screen displays distance, direction, and other information about the point to be staked.



Station: displays the station where the stake point occurs and the type of line segment it falls on in the alignment.

Segment: displays the name of the segment tangent to the point to be staked; if the point is on the Left or Right side of the road; and the specified offset, if any.

Angle Right: is the horizontal angle from the backsight to the stake point.

Horz Dist: is the horizontal distance from the total station to the stake point.

Vert Dist: is the vertical distance from the total station to the stake point.

ZE to Rod: is the zenith angle from the total station to the stake point.

Circle Zero: is used to modify the circle on the total station so that the angle right reading will be zero when it is facing toward the design point, which can sometimes be easier than turning to an obscure angle value. When this button is tapped, the following actions will occur:

1. A new backsight circle value is computed, sent to the instrument and stored in the raw data
2. The Angle Right value is changed to zero to reflect the change. The instrument now needs to be turned horizontally to zero to face the design point.
3. To prevent errors, the backsight set up is invalidated when exiting the Stakeout dialog if this button has been used. A Circle

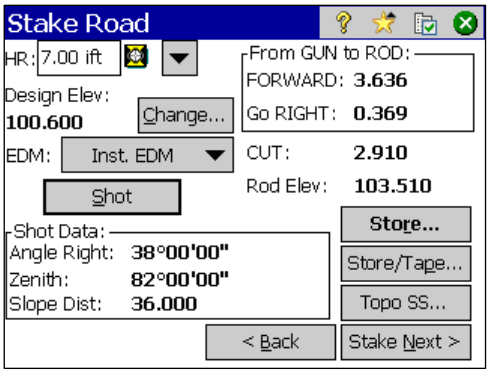
zeroed on a design point is meaningless once the design point has been staked.

Note: The Circle Zero button is not available when using a robotic total station.

< Back: returns to the previous screen.

Stake >: opens the final Stake Road screen where the shots to the stake point are performed.

Stake Road – Screen Four



Height of Rod: is the length of the rod.

Design Elev: displays the current design elevation, which can be modified with the Change... button.

FORWARD / **BACK**: indicates if the rod must move forward (toward the total station) or backward (away from the total station).

Go RIGHT / **Go LEFT**: indicates if the rod must move to the right or left from the total station's point of view.

EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

CUT / **FILL**: displays the required amount of cut or fill to bring the stake point to the design point's elevation.

Rod Elev: displays the elevation at the rod's location computed from the last shot.

Change...: is used to modify the current design elevation, which will also modify the associated CUT/FILL value for the current station being staked.

Shot: takes a shot to the prism and computes come/go, cut/fill information.

Shot data: displays the measurements from the last shot.

Store...: opens the next screen.

Store/Tape...: opens the Stake Out Point (Tape Offset) dialog box (Page R-309), where the staked point can be stored that includes a specified offset. The default value is the appropriate distance correction to the design point.

Topo SS...: stores a side shot using the data from the last shot taken. (This will not take a new shot.)

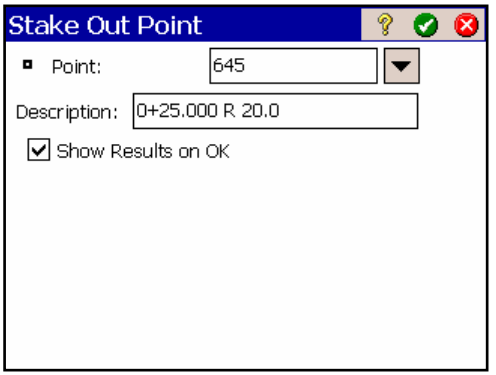
Turn Gun: (available with robotic total station) turns the total station toward the design point.

< Back: returns to the second screen.

Stake Next >: returns you to the second Stake Road screen, without storing a stake point, where the Design point is advanced by the Increment value.

Stake Road – Screen Five

This screen is used to describe the stake point before it is stored and select if the Results screen should be displayed (described next).



Point: is the point name for the stake point being stored.

Description: is the description for the stake point being stored. The default description is the station, side, and distance from the centerline for the design point.

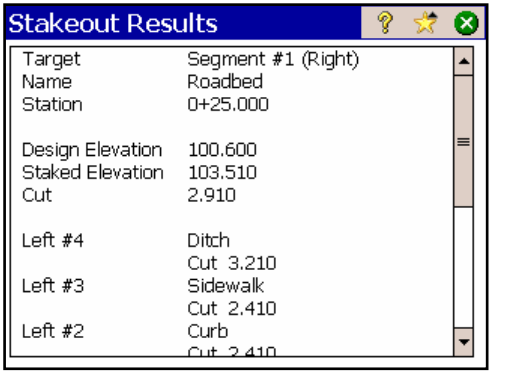
Show Results on OK: When this checkbox is checked, a Results screen (described next) will open after tapping from this screen.

Note: This screen will not appear if the Write Cut Sheet Data Only (No Store Point) checkbox is checked in the Stakeout Settings screen, although the Results screen will still appear if the Show Results on OK checkbox was never unchecked from this screen. (It is checked by default.)

Stake Road – Stakeout Results

This screen shows detailed cut/fill values, which may be needed when marking a road or offset stake.

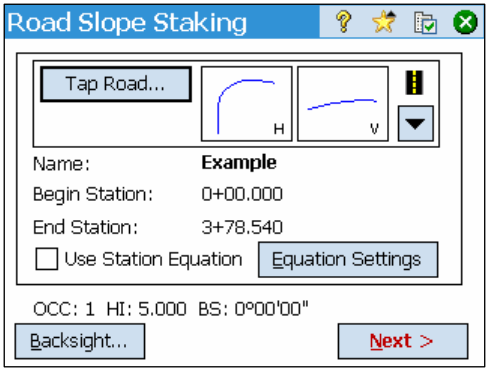
: returns you to the second Stake Road screen where the Design point is advanced by the Increment value.



Road Slope Staking

Roads | Slope Staking

The Road Slope Staking screen is used to locate the catch point of the road at any station.



Tap Road...: opens the Tap on a Road screen where you can tap on any road in the job to select it.

Name: displays the name of the selected road.

Begin Station: displays the station assigned to the beginning of the road.

End Station: displays the final station in the road.

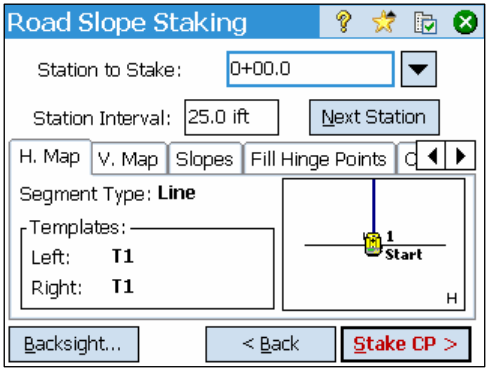
Use Station Equation: When checked, the current station equation will be applied to the road.

Equation Settings: opens the Station Equation screen (Page R-427) where a station equation can be configured.

Backsight...: opens the Backsight Setup screen (Page R-118).

Next >: takes you to the next Road Slope Staking screen where the slope staking parameters are set up.

Road Slope Staking – Screen Two



The second Road Slope Staking screen is used to set up some slope stake parameters prior to slope staking the road.

Station: is the station to be slope staked.

Station Interval: specifies how far to advance from the current station to the next station.

Next Station: advances the current station by the Station Interval.

Note: If the Stake Corners option is selected in the Stakeout Settings screen, the Next Station button will also stop at any horizontal or vertical alignment node, and the beginning and end of any widening and super elevation that falls within the interval.

Backsight...: opens the Backsight Setup screen (Page R-118).

< Back: returns to the previous screen.

H. Map Card

The H. Map card displays information about the horizontal details of the road at the current station.

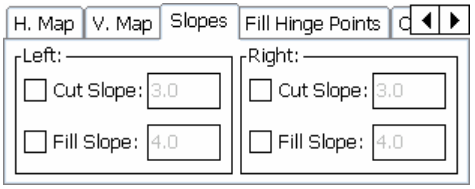
Segment Type: displays the type of horizontal section at the current station.

Left / **Right**: is the description of the left and right templates that are being used at the current station.

V. Map Card

The V. Map card displays a graphic of the cross-sectional profile of the road at the current station. The hinge points and slopes are also displayed.

Slopes Card

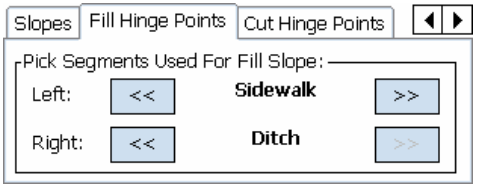


The Slopes card is used to specify the cut and fill slopes that will be used when computing the location of the catch point. The default values are the slopes stored in the template for the section being staked. To override a default slope, check the appropriate box and key in the new slope. The new slope entered will always be used regardless of the values stored in the templates. Changes to slopes will be reflected in the V. Map card graphic.

Cut Slope: is the left and right slope, respectively, used when the terrain requires a cut (the hinge point is located below the terrain's surface).

Fill Slope: is the left and right slope, respectively, used when the terrain requires a fill (the hinge point is located above the terrain's surface).

Cut/Fill Hinge Points Cards



The Fill Hinge Points tab and the Cut Hinge Points tab are used to select the segment where you want the hinge point location to be computed from in situations requiring a fill or a cut respectively. (The hinge point will occur at the node of the selected segment furthest from the centerline.) The hinge point can also be defined at different segments for the left and right sides of the road.

Left / **Right**: is the specified left and right segment, respectively, to compute the hinge point. Changes to these fields will be reflected in the V. Map card graphic.

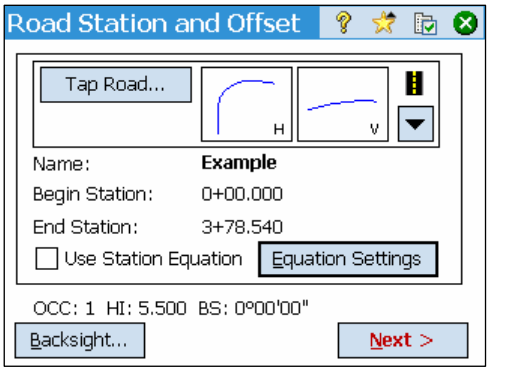
Stake CP >: opens the next slope staking screen. The following slope staking screens are identical to non-road layout slope staking screens and are described starting on Page R-295.

Road Station and Offset

Roads | Show Station

The Road Station and Offset routine allows you to take a shot to a prism that is positioned anywhere on the road and compute the details of where that point is located in relation to the road. This information can then be compared to the data from a grade sheet.

Tap Road...: opens the Tap on a Road screen where you can tap on any road in the job to select it.



Name: displays the name of the selected road.

Begin Station: displays the station assigned to the beginning of the road.

End Station: displays the final station in the road.

Use Station Equation: When checked, the current station equation will be applied to the road.

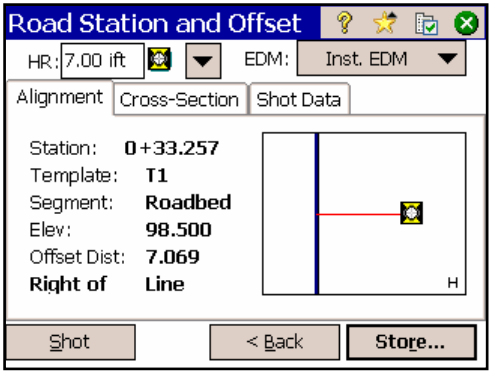
Equation Settings: opens the Station Equation screen (Page R-427) where a station equation can be configured.

Backsight...: opens the Backsight Setup screen (Page R-118).

Next >: takes you to the next Road Station and Offset screen where the slope staking parameters are set up.

Road Station and Offset – Screen Two

The second Road Station and Offset screen is used to take a shot to the prism and view the data from various cards.



Height of Rod: is the length of the rod.

EDM: This button can be toggled to shoot in various EDM modes. The options available depend on the total station being used. Consult the total station's documentation for more information on the EDM modes that it supports.

Shot: takes a shot to the prism.

< Back: returns to the previous screen.

Store...: stores the stake point.

Alignment Card

Station: displays the station at the rod position.

Template: displays the name of the template that is used at the rod position.

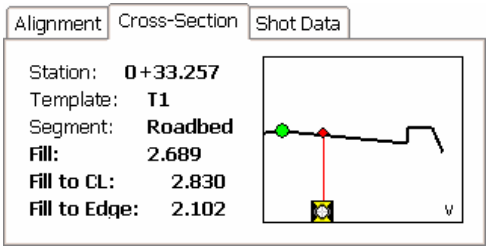
Segment: displays the name of the template's segment at the rod position.

Elev: displays the elevation at the rod position.

Offset Dist: displays the perpendicular offset from the centerline to the rod position.

Right of Line / **Left of Line** / **On Line**: displays if the rod position is to the right of the centerline, left of the centerline, or on the centerline, respectively.

Cross-Section Card



Station: displays the station at the rod position.

Template: displays the name of the template that is used at the rod position.

Segment: displays the name of the template's segment at the rod position.

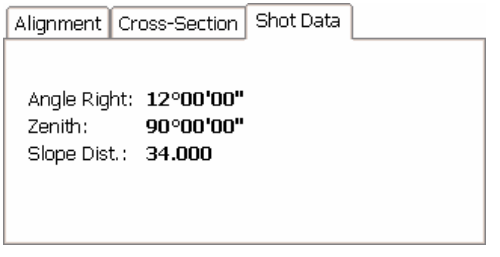
Cut / **Fill**: is the necessary cut or fill that will bring the rod position even with the road's surface.

Cut / **Fill to CL**: is the necessary cut or fill that will bring the rod position to the same elevation as the centerline at the current station.

Cut / **Fill to Edge**: is the necessary cut or fill that will bring the rod position to the same elevation as the outer edge of the last segment at the current station.

Shot Data Card

Displays the angles and distance measured by the total station from the last shot.

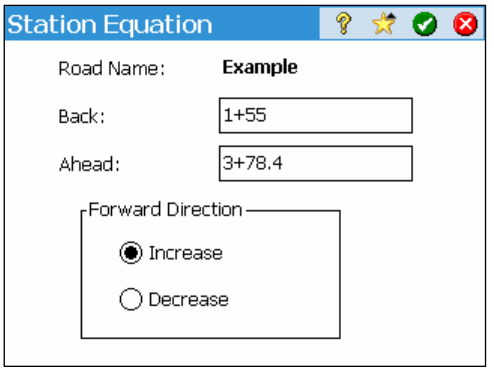


Station Equation

Roads | Road Stakeout | Equation Settings
or Roads | Slope Staking | Equation Settings
or Roads | Show Station | Equation Settings

The Station Equation screen is used to configure the stationing for an alignment with stationing that changes at a specific location. This situation might occur where the road you are staking merges with another road and once you stake past the point where the roads merge, you want to use the stationing assigned to the other road.

Once you pass the location where the stationing changes, all ahead stations are displayed with a (2) after it to differentiate between a back and ahead station, such as 11+00 (2). Likewise, when keying in an ahead station, you must append it with a (2) to indicate it is an ahead station.



Road Name: Displays the name of the current alignment.

Back: Defines the stationing on the back alignment where the stationing change occurs.

Ahead: Defines what the new stationing is for the same location defined in the Back field.

Increase: indicates the stationing should increase as you move forward past the location where the stationing changes.

Decrease: indicates the stationing should decrease as you move forward past the location where the stationing changes.

Note: When Stake "Corners", Not Just Even Intervals is checked in the Stakeout settings, the location where the stationing change occurs is considered a corner and will be included as you advance.

Adjust Menu

The Adjust Menu contains routines to perform a variety of adjustments.

A: Scale

B: Translate

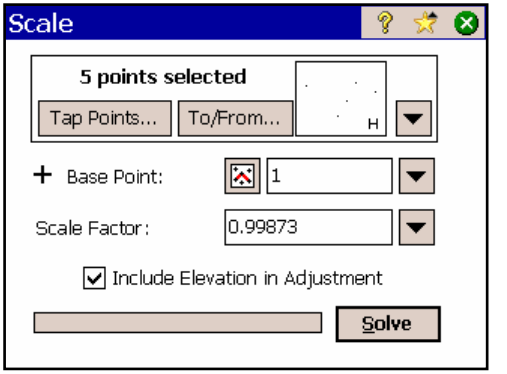
C: Rotate

D: Traverse Adjust

Scale

Adjust | Scale

The Scale screen will scale the distances of a range of points relative to a specified base point. This is useful to correct a survey where a scale factor was inadvertently applied during data collection.



Tap Points...: allows you to select points by tapping them from a map view.

To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Base point: The distances to all the selected points will be scaled relative to this point. (The coordinates for the base point will not change.)

Scale factor: is the scale factor that is applied to the distances from the base point to the selected points.

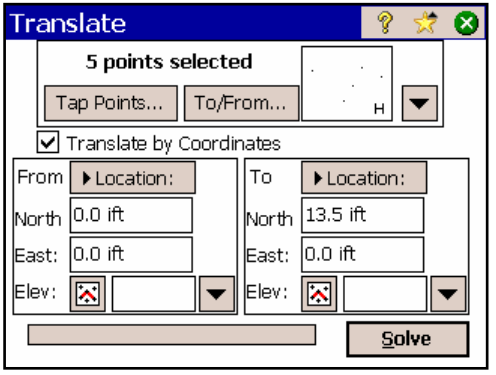
☑ **Include Elevation in Adjustment**: When checked, the elevations to the selected points will also be adjusted by the scale factor relative to the Base point.

Solve: will perform the adjustment on the selected points and change the coordinates accordingly. Information will be written to the raw data file detailing the adjustment.

Translate

Adjust | Translate

The Translate screen will move a group a points horizontally and vertically by a specified distance and direction.



Tap Points...: allows you to select points by tapping them from a map view.

To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

☑ **Translate by Coordinates**: When checked, all of the selected points will be adjusted in the same direction and distance as between a specified From point or location and a To point or location. When unchecked, the selected points will be adjusted by the specified direction and distance. The choice made here determines the options available below.

Note: The choice made above determines which fields will be available below.

▸ Azimuth / ▸ Bearing: is the direction to move the selected points.

Horizontal Distance: is the horizontal distance that the selected points are moved.

Vertical Distance: is the vertical distance that the selected points are moved.

From: is where the first point or location is defined that is used to compute the direction and distance that the selected points are adjusted.

To: is where the last point or location is defined that is used to compute the direction and distance that the selected points are adjusted.

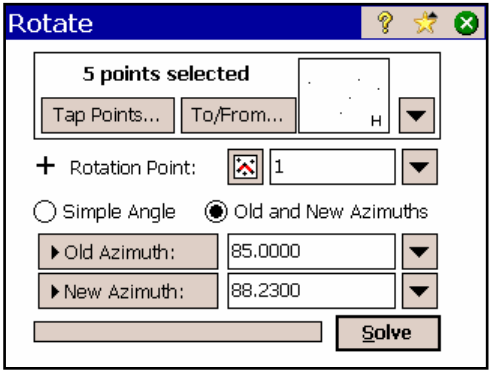
▸ Point / ▸ Location: allows you to enter either a point name or location coordinates.

Solve: adjusts the selected points in the same direction or distance as defined from the From point to the To point, or by the direction and distance entered. Information will be written to the raw data file detailing the adjustment.

Rotate

Adjust | Rotate

The Rotate screen will rotate selected points around a specified point. This is useful to correct a survey where an incorrect backsight was used during data collection.



Tap Points...: allows you to select points by tapping them from a map view.

To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

Rotation Point: The selected points will be rotated around the point specified here. (The coordinates for the rotation point will not change.)

Simple Angle: when selected, this allows you to enter the deflection angle to rotate the selected points.

Old and New Azimuths: when selected, this allows you to enter an old and new azimuth, which is used to compute the angle to rotate the selected points.

Note: The choice made from the two options above determines which fields will be available below.

Rotate: is the angle to rotate the selected points around the Rotation point.

▸ Old Azimuth / ▸ Old Bearing: is a known direction between any two points in the current job before they are rotated.

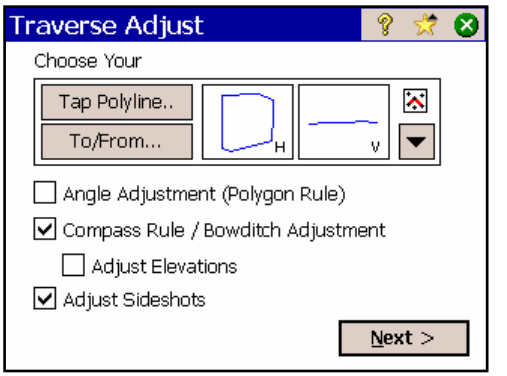
▸ New Azimuth / ▸ New Bearing: is the direction between the same two points specified above after the rotation.

Solve: will perform the rotation on the selected points and change the coordinates accordingly. Information will be written to the raw data file detailing the adjustment.

Traverse Adjust

Adjust | Traverse Adjust

The Traverse Adjust wizard is a series of screens that allow you to adjust a closed traverse for angular error and/or perform a compass rule adjustment on a closed or open traverse.



Choose Your Traverse: is used to select a traverse to adjust from the following options:

- Tap Polyline...: is used to tap an existing polyline from a map view.
- To/From...: Opens the Point List screen (Page R-443) where a point list can be created.

☑ **Angle Adjust**: When checked, will perform an angle adjustment to the closed traverse. An angle adjustment will apply the angular error equally among all of the angles of the closed traverse and adjust the coordinates for all but the first two traverse points. (The first leg of the traverse is not adjusted.)

☑ **Compass Rule**: When checked, will perform a compass rule adjustment on the selected traverse.

☑ **Adjust elevation**: when selected, the elevations for the traverse points are also adjusted from the compass rule adjustment.

☑ **Adjust Sideshots**: When checked, any side shots that were stored while occupying the traverse points in the selected traverse will also be adjusted.

The side shot locations will be recomputed using the original angles and distances stored in the raw data file along with the adjusted locations of the occupy and backsight points.

The user cannot explicitly define the side shots that are adjusted. Instead, they are determined by the information stored in the raw data file. If no side shots were stored from any of the traverse points, an error message will be displayed and no adjustment is performed.

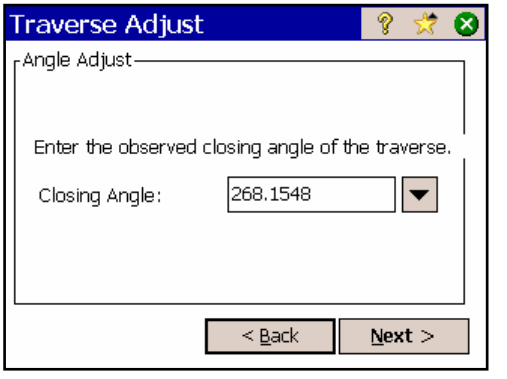
If any of the following settings were changed during or after the traverse was recorded, then side shots cannot be adjusted.

- Distance units
- Angle units
- Earth curvature adjustment
- Scale factor

Next > : opens the next screen of the adjustment wizard.

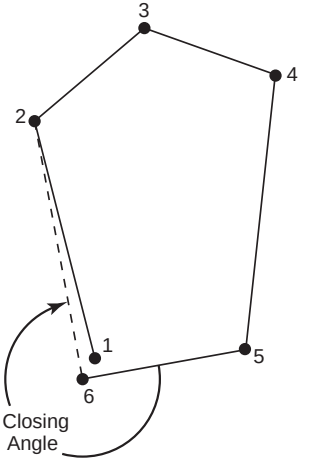
Traverse Adjust – Angle Adjustment

If an angle adjustment is being performed, this screen will appear next.



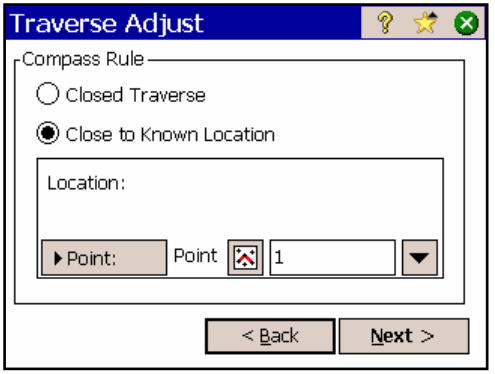
Closing Angle: is the closing angle for the traverse, which must be represented as an angle-right. (See illustration.)

Next > : opens the next screen of the adjustment wizard.



Traverse Adjust – Compass Rule

If a compass rule adjustment is being performed, this screen will appear next.



Closed Traverse: select this option if you are adjusting a closed traverse.

Close to Known Location: select this option if you are adjusting an open traverse and closing to a known point or location.

Note: if a closing location is not specified, it is automatically assumed that the first point of the traverse will be the closing location.

- Location: allows you to enter coordinates to define the closing location.
  - **North**: is the Y-coordinate for the closing location.
  - **East**: is the X-coordinate for the closing location.
  - **Elev**: is the elevation for the closing location.
- Point: allows you to select an existing point to define the closing location.
  - **Point**: is the name of the existing point at the closing location.

Next: opens the next screen of the adjustment wizard.

Traverse Adjust – Results

This screen displays the changes that will be made by the adjustment, where they can be previewed before the actual adjustment is made.

The screen lists the adjustment details in three main sections: the angle adjustment details; the compass rule adjustment details, and the point details where the before-and-after coordinates for each point are listed. An example of the information provided in the Preview screen is shown here.

Error dist: is the horizontal distance between the starting point and closing point.

Error azm: is the direction from the closing point to the starting point.

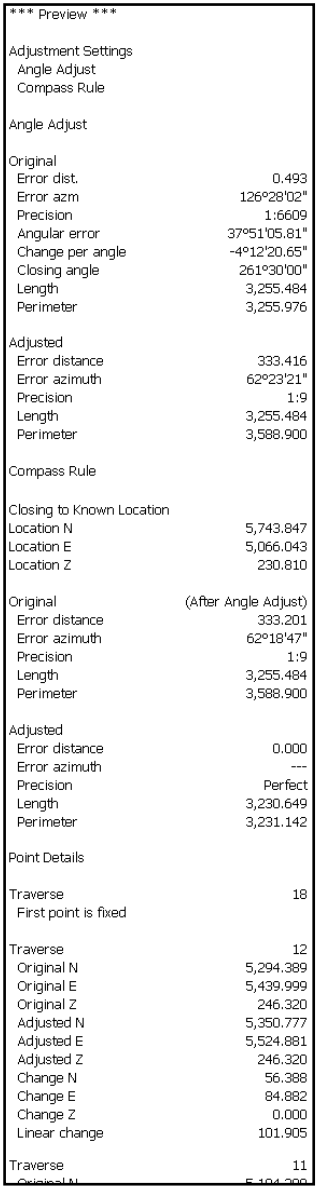
Precision: is the ratio of the error distance to the length.

Angular error: is the difference between (N-2)·180 and the actual sum of the internal angles, where N is the number of sides in the traverse.

Length: is the sum of all the sides of the boundary.

Perimeter: is the length plus the error distance.

Adjust: if the results in the preview are acceptable tap this button to perform the adjustment.



*** Preview ***

Adjustment Settings
Angle Adjust
Compass Rule

Angle Adjust

Original	
Error dist.	0.493
Error azm	126°28'02"
Precision	1:6609
Angular error	37°51'05.81"
Change per angle	-4°12'20.65"
Closing angle	261°30'00"
Length	3,255.484
Perimeter	3,255.976
Adjusted	
Error distance	333.416
Error azimuth	62°23'21"
Precision	1:9
Length	3,255.484
Perimeter	3,588.900

Compass Rule

Closing to Known Location	
Location N	5,743.847
Location E	5,066.043
Location Z	230.810
Original	(After Angle Adjust)
Error distance	333.201
Error azimuth	62°18'47"
Precision	1:9
Length	3,255.484
Perimeter	3,588.900
Adjusted	
Error distance	0.000
Error azimuth	---
Precision	Perfect
Length	3,230.649
Perimeter	3,231.142

Point Details

Traverse	18
First point is fixed	
Traverse	12
Original N	5,294.389
Original E	5,439.999
Original Z	246.320
Adjusted N	5,350.777
Adjusted E	5,524.881
Adjusted Z	246.320
Change N	56.388
Change E	84.882
Change Z	0.000
Linear change	101.905
Traverse	11

Miscelaneous Screens

The following screens are only available via a Quick Pick or a power button (see the User's Manual). They are not available directly from any menu item.

Past Results

Create Points

Trimble Slant HR -> HR

Convert Slant HI to HI

Quick Pick Editor

Map View

Map Display Options

Basemaps

Smart Targets

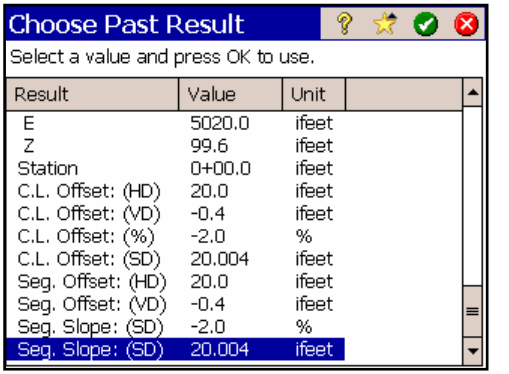
Disable Touch-Screen

Past Results

▼, Past Results (where applicable)

When the Past Results option is used to enter a value in a specific field that was computed previously within Survey Pro.

Select the line that contains the value that you want to use and tap ✔. The selected value will then be entered in the field associated with that power button.



Create Points Screen

Job | Edit Alignments | ▼ **Create Points**

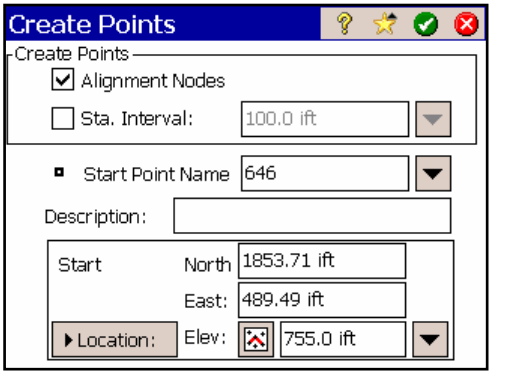
The Create Points screen is used to store points that coincide with specific locations on an alignment.

Alignment Nodes: When checked, will store points at locations where a change occurs on an alignment, for example where a straight section and a curved section meet.

Sta. Intervals: When checked, will store a point at the specified station interval along an alignment.

Start Point Name: is the name for the first point that will be stored from this screen.

Description: is the description that will be given to all the points that are stored from this screen.



Start Location: is the location for the first point, which is the reference location used to compute the locations of the remaining points. The default location is the POB defined from the Edit Alignment screen.

Trimble Slant HR -> HR

(From any HR field), Trimble Slant HR -> HR

This option only applies when using a Trimble Traverse Kit that allows the measurement of a Slant HR instead of the usual HR.

When this option is selected, it will convert a Slant HR entered in an HR field to a standard HR. This must be performed each time a new Slant HR is entered in the HR field.

Consult the documentation that came with the Trimble Traverse Kit for more information on correctly measuring a Slant HR.

Convert Slant HI to HI

(From any HI field), Convert Slant HI to HI

This option is only available when using a Trimble total station that supports a Slant HI instead of the usual HI, such as a Trimble S6.

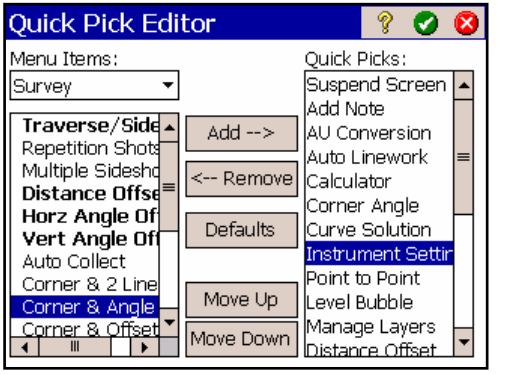
When this option is selected, it will convert a Slant HI entered in an HI field to a standard HI. This must be performed each time a new Slant HI is entered in an HI field.

Consult the documentation that came with the Trimble Total Station from more information on correctly measuring a Slant HI.

Quick Pick Editor

, Edit Quick Pick (located at bottom of list)

The Quick Pick Editor is used to customize the list of routines available from the Quick Pick button .



Menu Items: Is a dropdown list containing the menu items you would normally see in the Main Menu. Selecting a menu item from this list will display all of the routines from that menu item that can be included in the Quick Pick list. Routines listed in bold are already in the Quick Pick list.

Add --> : will add the routine selected in the left column to the bottom of the Quick Pick list, which can then be moved elsewhere in the list.

Defaults : will revert the Quick Pick list back to the defaults. A prompt will first ask you if you are sure before the changes occur.

Quick Picks: is the list of routines available from the current Quick Pick list.

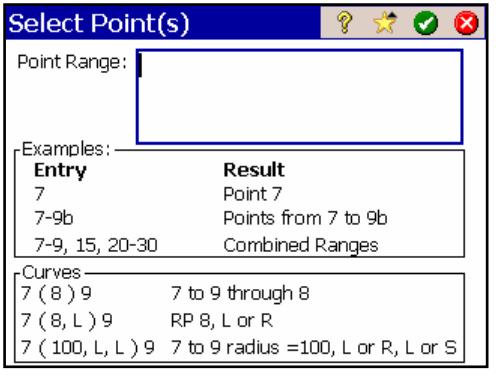
Move Up : will move the routine selected in the right column up one level toward the top of the list.

<-- Remove : will remove the selected routine from the current Quick Pick list.

Move Down : will move the routine selected in the right column down one level (toward the bottom of the list).

Point List Editor

Tap To/From... from a variety of screens.



The Select Point(s) screen is used to define a simple list of points or a list of points that define a line that can include curves depending on where the screen is accessed from.

Examples of how to enter different lists of points are displayed in the lower portion of the screen. See *Point Lists* in the User's Manual for more information.

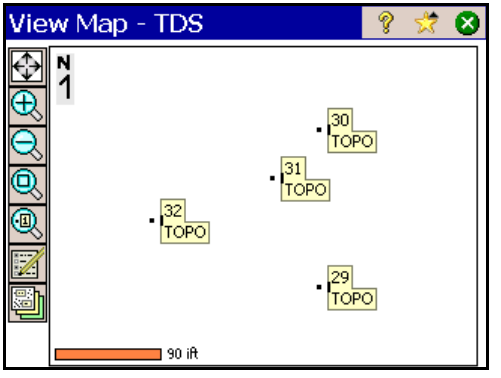
Point Range: is the area where you enter your point list using the same format as shown in the examples.

Note: Spaces in a point list are ignored.

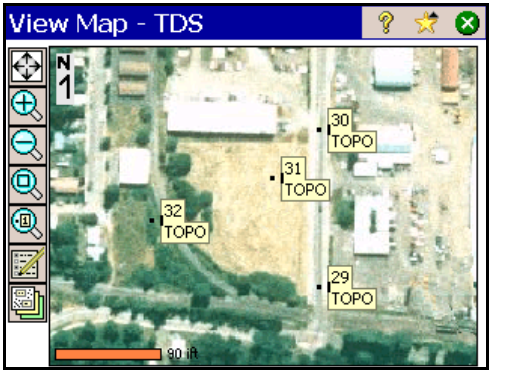
Once the list is entered, tap ✔ to return to the previous screen.

Map View

or from the command bar in various screens.



Map View without basemaps



Map View with basemaps

Many screens provide access to a map view, which shows data from the current job. It can be accessed from the Main Menu in the command bar with the button, or any screen that has a button. Some map views display additional information, such as a vertical profile.

Tip: You can pan around your map by dragging your finger or stylus across the screen.

Zoom Extents Button: will change the scale of the screen so that all the points in the current job will fit on the screen.

Zoom In Button: will zoom the current screen in by approximately 25%.

Zoom Out Button: will zoom the current screen out by approximately 25%.

Zoom Window Button: allows you to drag a box across the screen. When your finger or stylus leaves the screen, the map will zoom to the box that was drawn.

Zoom To Point Button: prompts you for a point name and then the map view will be centered to the specified point with the point label displayed in red.

Turn To Point Button: Tap this button and then tap a point in the map view to automatically turn the total station to the selected point. This is only available when a robotic total station is selected and Remote Control is active in the Instrument Settings.

Increase Vertical Scale: is only available when viewing a vertical profile. Each time it is tapped, the vertical scale of the view is increased.

Decrease Vertical Scale: is only available when viewing a vertical profile. Each time it is tapped, the vertical scale of the view is decreased.

Zoom Preview Button: will display only the points that are currently in use (only available from certain map view screens).

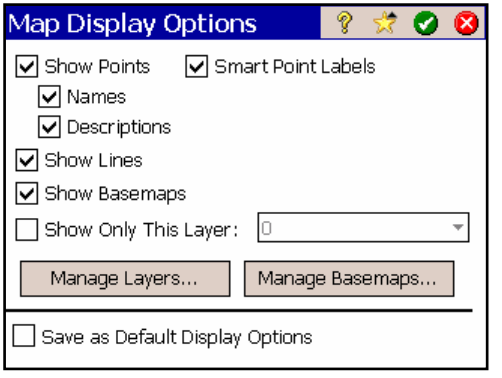
Map Display Options: opens the Map Display Options screen, described below.

Manage Basemaps: opens the Manage Basemaps screen, described below (only available from the main map view, accessed from the command bar button).

Map Display Options

From the Map View, tap

The Map Display Options screen is used to configure the information that is displayed in the Map View.



Show Points: will show a dot for each point in view.

Smart Point Labels: displays only certain point labels (name and description) when many points are grouped together to reduce clutter.

Names: will show the point name for each point that is in view.

Descriptions: will show the point description for each point in view.

Show Lines: will show all the polylines that are on the DTM layer

Show Basemaps: will display any basemaps selected for the current job.

Show Only This Layer: When checked, will show only the selected point data that exists on the specified layer. When unchecked, point data from all layers is displayed.

Manage Layers...: opens the Manage Layers screen (Page R-87) where the layers can be configured.

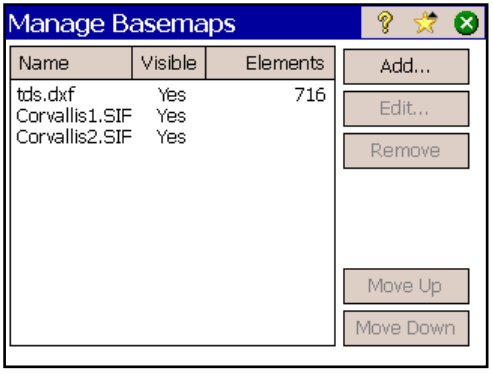
Manage Basemaps...: opens the Manage Basemaps screen, described below, where basemaps can be added to the current job.

Save as Default Display Options: When checked, will save the selections made to this screen as the default selections.

Manage Basemaps

From the Map View, tap , Manage Basemaps

The Manage Basemaps screen is used to select the basemaps to display in the map view for the current job. Consult the User's Manual for more information on using basemaps.



The main portion of the screen lists the names of all the basemaps that have been added to the current job. The other columns display if each basemap is visible and the number of elements in the vector basemaps.

Add...: allows you to select additional basemaps for the current job.

Edit...: opens the Edit Basemap screen, described below, where you can preview or edit the selected basemap. (Raster basemaps cannot be edited.)

Remove...: removes the selected basemap from the list. (The source file will not be removed.)

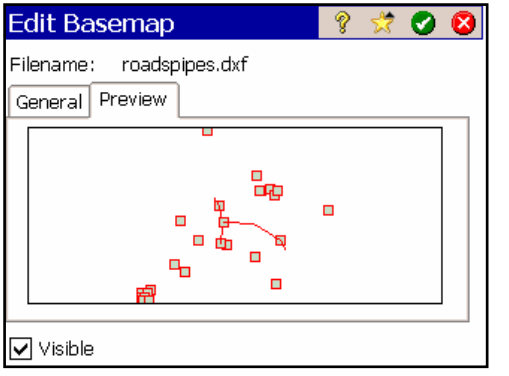
Move Up: will move the selected basemap up one level in the list. (Consult the User's manual for information on how to manage basemaps.)

Move Down: will move the selected basemap down one level in the list.

Edit Basemaps

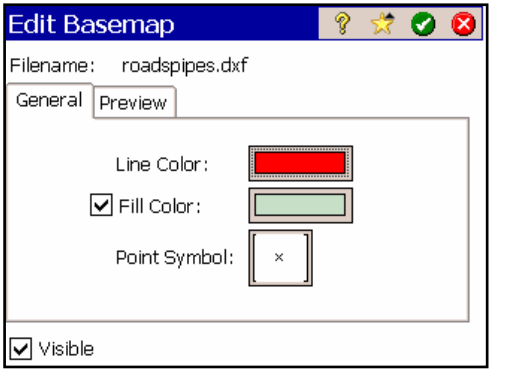
From the Map View, tap Manage Basemaps Edit...

The Edit Basemaps screen is used to preview the selected basemap, and if it is a vector basemap, the way the basemap appears can be changed.



The Preview page shows how the selected basemap will look in the map view.

Visible: when checked, the selected basemap will be visible in the map view.



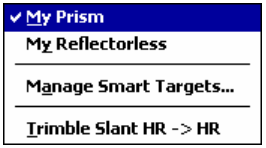
The General page is only available when a vector basemap is selected and is used to customize the way the basemap appears in the map view.

Line Color: is used to select the line color of the basemap.

Fill Color: is used to select the color for the 2D objects in the basemap.

Point Symbol: is used to select from a variety of symbols for the points in the basemap (these will not affect the appearance of the points in the current job).

Smart Targets



Tap a ▼ power button next to a (indicating a prism Smart Target is currently selected) or (indicating a reflectorless Smart Target is currently selected). This item is available from any screen where the rod height can be adjusted.

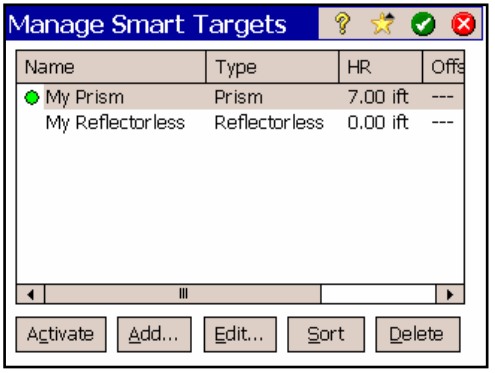
Smart Targets provide a convenient way to work with different prisms and/or target types on the same job. See the User's Manual for more information.

Quickly change to any available user-configured smart target by tapping it from the upper portion of the list. The active Smart Target is marked with a ✓.

Manage Smart Targets...: Opens the Manage Smart Targets screen, described next, where a custom target can be configured.

Manage Smart Targets

▼, **Manage Smart Targets**



The Manage Smart Targets screen is used to edit existing custom targets or configure a new custom target type.

The upper portion of the screen lists all the custom targets that are currently available. To select a target, tap it from this list. The selected target can then be edited, deleted, or activated.

Add: Opens the Edit Smart Target screen, described next, where a new custom target can be created.

Edit: Opens the Edit Smart Target screen, described next, where the selected Smart Target can be modified.

Delete: Deletes the selected Smart Target.

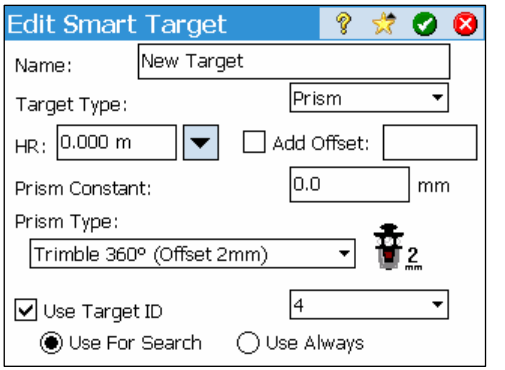
Activate: Activates the selected Smart Target. The active smart target is marked with the ● symbol.

Note: It is not necessary to access the Manage Smart Targets screen to activate a different Smart Target. You can quickly activate a Smart Target by tapping ▼ next to any HR field and then tap the desired Smart Target from the list that appears.

Edit Smart Target

▼, **Manage Smart Targets**, Add or Edit

The Edit Smart Target screen is used to edit an existing Smart Target or create a new one.



Name: is the desired name for the Smart Target.

Target Type: defines the type of target as being a Prism, Reflectorless, Long Range, which increases the EDM power, or On Gun, which uses whichever EDM settings are configured on the total station (for Leica total stations only).

HR: is the default HR for the Smart Target.

Add Offset to HR: when checked, the offset entered will always automatically be added to the HR entered for the Smart Target.

Prism Constant: is the prism constant for the Smart Target.

Note: If a prism constant is entered for a Smart Target while a prism constant is also set in the total station, the prism constant will be applied twice, resulting in incorrect distance measurements for every shot. Be sure the prism constant is set to zero in the total station if entering a value for a Smart Target, or vice-versa.

Prism Type: This option allows you to choose one of the following three types of prisms when using a supported Trimble total station:

- Generic: Select this option if using a generic (non-Trimble 360°) prism. It is up to the user to enter the correct prism constant and manually angle the prism vertically toward the total station before taking any shots to avoid introducing error.
- Trimble 360° (2mm): Select this option when using a Trimble 360° prism. This selection will apply the appropriate vertical angle correction constant for this prism to correct the error that is introduced when taking a shot to the prism at an extreme vertical angle. The icon is displayed to help the user identify that the correct prism is selected and the Prism Constant automatically defaults to 2 millimeters.
- Trimble MultiTrack (10mm): Select this option when using a Trimble MultiTrack prism. The icon is displayed to help the user identify that the correct prism is selected and the Prism Constant automatically defaults to 10 millimeters. (See note below.)

Note: When using a Trimble MultiTrack prism in passive mode (active tracking turned off), it is important to leave the Use Target ID box unchecked and if the active tracking is enabled, to leave Use Target ID box checked since a different vertical correction is applied for each case.

Use Target ID: When checked, the Target ID can be selected for the Smart Target. (This option is only available when using a total station and prism that supports target IDs.)

- **Use For Search**: When selected, the total station will check the Target ID only when searching for the prism and then track the prism. (Once the prism is being tracked, the total station can potentially start tracking a different reflector that comes into view.)
- **Use Always**: When selected, this forces the total station to continuously check the Target ID; even while tracking the

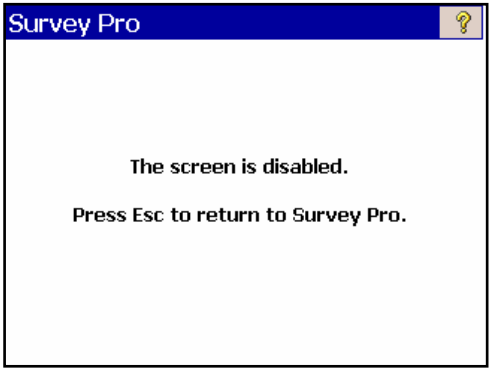
prism eliminating the possibility of the total station tracking a different reflector that comes into view.

Using Active Prism: Check this option when using an active prism. (This option is only available when using a total station that supports active prisms.)

Note: In order to perform automatic repetitions when using active prisms, active prisms must be set up over both the backsight and foresight.

Disable Touch-Screen

[CTRL] - [␣] (space)



This option can be used to disable the touch-screen when it is necessary to wipe it off. Press [ESC] to reactivate the touch-screen and return to Survey Pro.

You can also temporarily deactivate the touch-screen using either of the following methods:

- Use the , Suspend Screen quick pick. Press [ESC] to reactivate.
- *Ranger 300X/500X only*: Press [Fn] - [ ]. Repeat to reactivate.

Appendix A

Transverse Mercator Zones

Central Meridians for State Plane Coordinates

E = East
W = West
C = Central

State	Zone	Central Meridian	State	Zone	Central Meridian
Alabama	E	85 50	Hawaii	1	155 30
	W	87 30		2	156 40
				3	158 00
Alaska	2	142 00		4	159 30
	3	146 00		5	160 10
	4	150 00			
	5	154 00	Idaho	E	112 10
	6	158 00		C	14 00
	7	162 00		W	115 45
	8	166 00			
	9	170 00	Illinois	E	88 20
Arizona	E	110 10		W	90 10
	C	111 55			
	W	113 45	Indiana	E	85 40
				W	87 05
Delaware		75 25			
			Maine	E	68 30
Florida	E	81 00		W	70 10
	W	82 00			
			Michigan	E	83 40
Georgia	E	82 10	(1934)	C	85 45
	W	84 10		W	88 45

State	Zone	Central Meridian	State	Zone	Central Meridian
Mississippi	E	88 50	New Mexico	E	104 20
	W	90 20		C	106 15
				W	107 50
Missouri	E	90 30			
	C	92 30	New York	E	74 20
	W	94 30		C	76 35
				W	107 50
Nevada	E	115 35			
	C	116 40	Vermont		72 30
	W	118 35			
			Wyoming	1	105 10
New Hampshire		71 40		2	107 20
				3	108 45
New Jersey		74 40		4	110 05

Lambert Zones

Central Meridian and Zone Constants for State Plane Coordinates

N = North
S = South
C = Central

NC = North Central
SC = South Central
M = Mainland

I = Island
O = Offshore

State	Zone	Central Meridian	Zone Constant
Arkansas	N	92 00	0.581899
	S	92 00	0.559691
California	1	122 00	0.653884
	2	122 00	0.630468
	3	120 30	0.612232
	4	119 00	0.596587
	5	118 00	0.570012
	6	116 15	0.549518
	7	118 20	0.561243
Colorado	N	105 30	0.646133
	C	105 30	0.630690
	S	105 30	0.613378
Connecticut		72 45	0.663059
Florida	N	84 30	0.502526
Iowa	N	93 30	0.677745
	S	93 30	0.658701
Kansas	N	98 00	0.632715
	S	98 30	0.614528
Kentucky	N	84 15	0.622067
	S	85 45	0.606462
Louisiana	N	92 30	0.528701
	S	91 20	0.500013
	O	91 20	0.454007
Maryland		77 00	0.627634
Massachusetts	M	71 30	0.671729
	I	70 30	0.661095
Michigan	N	87 00	0.722790
	C	84 20	0.706407
	S	84 20	0.680529
Minnesota	N	93 06	0.741220
	C	94 15	0.723388
	S	84 20	0.700928
Montana	N	109 30	0.746452
	C	109 30	0.733354
	S	109 30	0.714901
Nebraska	N	100 00	0.673451
	S	99 30	0.656076

New York (Long Island)		74 00	0.654082
North Carolina		79 00	0.577171
North Dakota	N	100 30	0.744133
	S	100 30	0.729383
Ohio	N	82 30	0.656950
	S	82 30	0.634520
Oklahoma	N	98 00	0.590147
	S	98 00	0.567617
Oregon	N	120 30	0.709186
	S	120 30	0.684147
Pennsylvania	N	77 45	0.661540
	S	77 45	0.648793
South Carolina	N	81 00	0.564497
	S	81 00	0.544652
South Dakota	N	100 00	0.707738
	S	100 20	0.689852
Tennessee		86 00	0.585440
Texas	N	101 30	0.579536
	NC	97 30	0.545394
	C	100 20	0.515059
	SC	99 00	0.489913
	S	98 30	0.454007
Utah	N	111 30	0.659355
	C	111 30	0.640579
	S	111 30	0.612687
Virginia	N	78 30	0.624118
	S	78 30	0.606925
Washington	N	120 50	0.744520
	S	120 30	0.726396
West Virginia	N	79 30	0.637773
	S	81 00	0.618195
Wisconsin	N	90 00	0.721371
	C	90 00	0.705577
	S	90 00	0.687103

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